Annual Report 2016

JTSB Japan Transport Safety Board

JTSB Mission

We contribute to

- preventing the occurrence of accidents and
- mitigating the damage caused by them,

thus improving transport safety while raising public awareness, and thereby protecting the people's lives by

- accomplishing appropriate accident investigations which thoroughly unveil the causes of accidents and damages incidental to them, and
- urging the implementation of necessary policies and measures through the issuance of safety recommendations and opinions or provision of safety information.

JTSB Principles

1 Conduct of appropriate accident investigations

We conduct scientific and objective accident investigations separated from apportioning blame and liability, while deeply exploring into the background of the accidents, including the organizational factors, and produce reports with speed. At the same time, we ensure that the reports are clear and easy to understand and we make efforts to deliver information for better understanding.

2 Timely and appropriate feedback

In order to contribute to the prevention of accidents and mitigation of the damage caused by them, we send messages timely and proactively in the forms of recommendations, opinions or factual information notices nationally and internationally. At the same time, we make efforts towards disclosing information in view of ensuring the transparency of accident investigations.

3 Consideration for victims

We think of the feelings of victims and their families, or the bereaved appropriately, and provide them with information regarding the accident investigations in a timely and appropriate manner, and respond to their voices sincerely as well.

4 Strengthening the foundation of our organization

We take every opportunity to develop the skills of our staff, including their comprehensive understanding of investigation methods, and create an environment where we can exchange opinions freely and work as a team to invigorate our organization as a whole.

A Message from the Chairman

The accidents investigated by the Japan Transport Safety Board have great impacts on the lives of people, with last year being one in which such accidents occurred in all modes consisting of aircraft, railways, and marine transportation.

Regarding aircraft, the "Asiana Aircraft Accident at Hiroshima Airport (April)" and the "Small Aircraft Crash at Tokyo (July)" occurred; regarding railways, the "JR East Yamanote Line Dangerous Damage in Facilities (Fall of a Utility Pole on Tracks) Serious Incident (April)" occurred; and regarding marine transportation, the "Passenger Ferry Sunflower Daisetsu Fire Accident (July)" occurred, all of which were investigated by our Board.

Meanwhile, 2015 was also a year in which investigation reports for major accidents that had occurred in the past were published. Regarding marine transportation, the report for the "Collision Between Tank Landing Ship Osumi and Pleasure Boat Tobiuo" which occurred in January 2014 was published in February; and regarding railways, the report for the "JR Hakodate Line Freight Train Derailment" which occurred in September 2013 was published in January. Also, the report for the "JR Esashi Line Freight Train Derailments" which occurred in September 2012 and June 2014 were published in December, accompanied by the submission of our opinions on them to the Minister of Land, Infrastructure, Transport, and Tourism.

The current situation is that in addition to accidents like these which draw high social interest, the number of accidents both large and small that are occurring is still virtually endless. The JTSB is taking action to contribute to preventing the recurrence of accidents by enriching and advancing our investigations so that we can identify the causes of accidents accurately and quickly, and by distributing information on our accident investigation findings.

"JTSB 2016 Annual Report" presents summaries of investigation reports for accidents occurring in each of the modes consisting of aircraft, railway, and marine transportation, which have been published by the JTSB in 2015, as well as summaries of accidents and incidents that occurred in 2015 and have become new subjects of investigation, accompanied by statistical materials. It is our hope that through this report, readers will be able to discover effective lessons for accident prevention from their own individual perspectives.

I was appointed to the position of Chairman of the JTSB in February of this year, and am dedicating myself to the serious responsibility of working to prevent aircraft, railway, and marine accidents and reducing the damage that they cause.

Your understanding of, and cooperation with, our activities is deeply appreciated.

Kazuhiro Nakahashi
Chairman
Japan Transport Safety Board
July 2016

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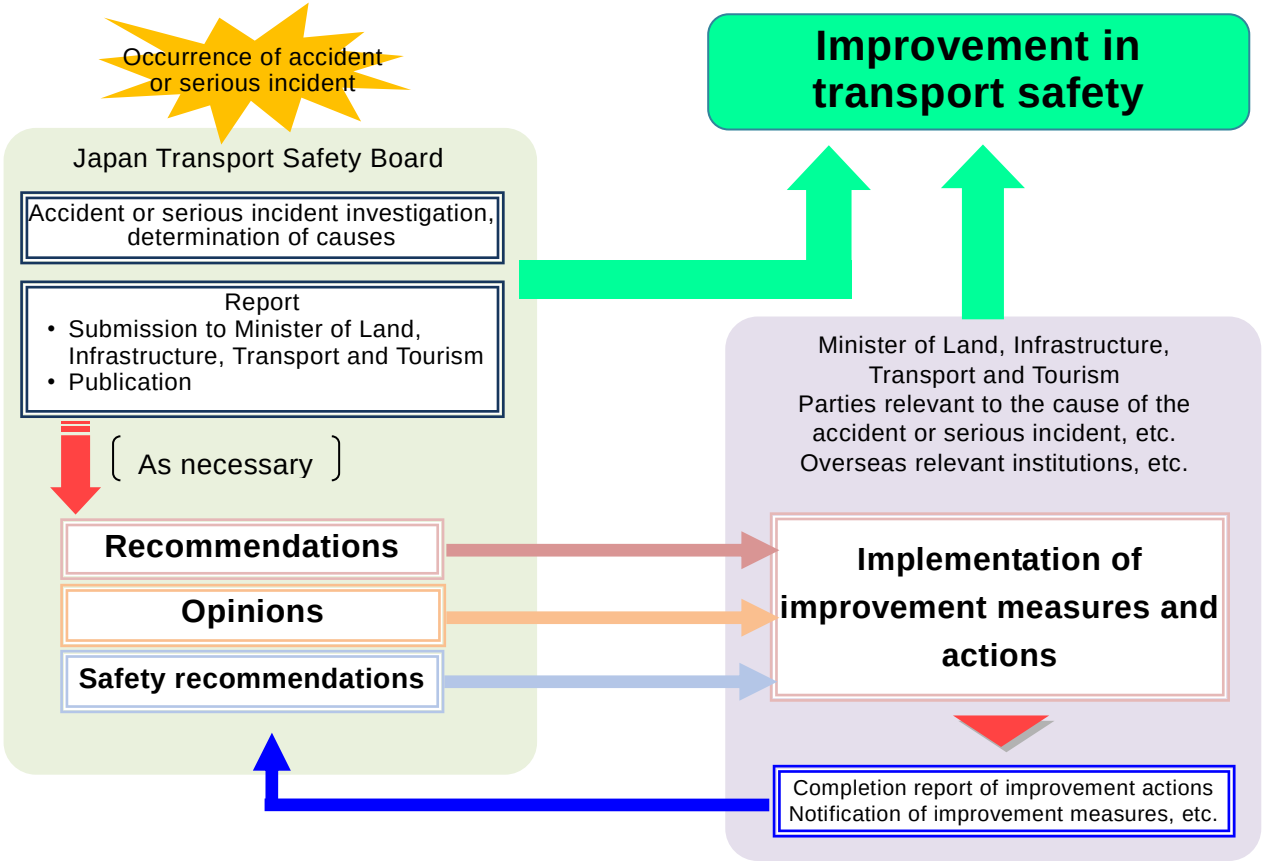
Chapter 1 Summary of Recommendations and Opinions Issued in 2015

In order to fulfill the objectives of the law specified in Article 1 of the Act for Establishment of the Japan Transport Safety Board (hereinafter referred to as "the "Establishment Act"), the Japan Transport Safety Board has been established as an external bureau of the Ministry of Land, Infrastructure, Transport and Tourism based on the regulations of Paragraph 2, Article 3 of the National Government Organization Act (Article 3 of the Establishment Act). Its duty is to accurately conduct studies investigating the causes of aircraft, railway, and marine accidents and serious incidents, as well as the causes of damage occurring due to those accidents and serious incidents, while also requesting required measures and actions to be taken by the Minister of Land, Infrastructure, Transport and Tourism or parties relevant to the causes of accidents or serious incidents, based on the results of its investigations (Article 4 of the Establishment Act).

Specifically, the Japan Transport Safety Board has the ability to give recommendations to the Minister of Land, Infrastructure, Transport and Tourism or parties relevant to the causes of accidents or serious incidents, regarding measures that should be taken for the prevention of accidents or serious incidents, or for reducing their damage, based on the results of its accident investigations. The Minister of Land, Infrastructure, Transport and Tourism must provide notifications to the Japan Transport Safety Board on measures that have been taken based on its recommendations, and if parties relevant to the causes of accidents or serious incidents do not take measures in response to recommendations that have been given, the Japan Transport Safety Board has the ability to publicly disclose that fact (Articles 26 and 27 of the Establishment Act).



In addition to actions based on individual accident investigation results, if it is recognized to be necessary at an interim stage of investigations or from investigation results of multiple past accidents, the Japan Transport Safety Board has the ability to state its opinions to the Minister of Land, Infrastructure, Transport and Tourism or the directors of related government institutions regarding measures that should be taken to prevent accidents or serious incidents and to reduce their damage (Article 28 of the Establishment Act).

In the cases of aircraft and marine accidents, etc., the Japan Transport Safety Board may provide recommendations (safety recommendations) on measures that should be taken quickly in order to improve safety, to related overseas institutions or parties as necessary in any stage of accident investigations, based on international treaties.

The recommendations and opinions issued by the Japan Transport Safety Board in 2015 are summarized as follows.

There were no safety recommendations issued.

1 Recommendations

Aircraft Serious Incident Involving a Bombardier CL-600-2B19 Registered JA206J, Operated by J-AIR Corporation

(Recommended on February 26, 2015)

<Summary of the Accident>

On Monday, May 6, 2013, a Bombardier CL-600-2B19, registered JA206J, operated by J-AIR Corporation, took off from Oita Airport as the scheduled flight 2362 of Japan Airlines Corporation, a code-sharing partner, and landed on runway 32R at Osaka International Airport. While the aircraft was taxiing on the taxiway after landing, a caution message was displayed for a right engine fire detection system failure at around 12:15 Japan Standard Time (JST: UTC+9hr), and subsequently a warning message was displayed for a right engine fire. While the crew responded to the engine fire warning message, the aircraft continued to taxi and entered the parking spot. During maintenance work after the flight, evidence of fire was found within the engine fire-prevention area.

A total of 55 persons were on board the aircraft, including the captain, two crew members, and 52 passengers. There were no injuries.

<Probable Causes>

It is highly probable that the cause of this serious incident was that the coupling nut connecting the right engine fuel manifold (fuel supply piping) and fuel injector (fuel injection nozzle) No. 14 was loose, fuel leaked from this area and was ignited by the heat of the engine, which resulted in fire within the engine fire-prevention area.

Although it is somewhat likely that the reason why the coupling nut was loose was the insufficient tightening force of the coupling nut, resulting in gradually loosening caused by factors such as engine vibration, the Japan Transport Safety Board couldn't determine the cause of the loosening.

Recommendations to IHI Corporation

When conducting engine overhauls, reconfirm that the system ensures that important work for safety is surely carried out, including the tightening of the coupling nuts connecting the injector and manifold.

Recommendations to J-AIR Corporation

Enhance education and training involving important system functions for safety and reconsider the contents of training in response to an outbreak of fires.

Actions Taken in Response to the Recommendations

As a result of the investigation of an aircraft serious incident which occurred on the taxiway of Osaka International Airport on May 6, 2013, the JTSB published an investigation report and made recommendations to IHI Corporation and J-AIR Corporation as parties relevant to the cause of the serious incident on February 26, 2015. The Board received the following report on the actions taken in response to the recommendations.

○ Actions Taken by IHI Corporation in Response to the Recommendations

1. Identification of content for re-examination

(1) Examinations in response to this event (method of tightening coupling nuts)

It was discovered that the torque on the coupling nuts of 4 engines, including the engine that caused the serious incident, was low, causing the nuts to be loose. In the procedures for tightening the coupling nuts, a worker performs the tightening work and an inspector then checks the work visually or by manual confirmation. However, in the inspection processes after the nuts were tightened by workers, the inspector confirmed that they had been tightened but did not confirm the tightened torque values, and there were no records left that could be used to eliminate the possibility of insufficient tightening strength due to worker error and so on.

There is a need for improvements so that records, etc. are left stating that workers have reliably performed tightening work using the regulated torque values, and so that response measures can be quickly taken if any abnormalities occur. Therefore, examinations must be conducted from the perspective of confirming whether records can indicate that the tightening work of the coupling nuts, which is considered to be important for safety, has been reliably performed according to the manual, or whether appropriate preventive measures, such as structures that can prevent loosening, have been performed. These measures should be performed not only on the applicable engines, but horizontally deployed to other engines as well.

(2) Horizontal deployment to work items that are important for safety

In the engine manual, the engine manufacturer has applied its design-related knowledge and the experience of users to provide special warnings with an additional notation of “CAUTION” on work with the possibility of leading to part damage if its procedures are not carried out properly. All work tasks additionally marked with “CAUTION” in the manual shall become

targets of examination in order to ensure that work important for safety is carried out reliably, and re-examinations shall be performed regarding whether the work can be reliably performed according to the manual, whether records indicating that it has been reliably performed can be indicated, and whether appropriate preventive measures are carried out in subsequent steps, etc.

2. Plan for implementation of re-examinations

Re-examinations to determine whether systems are in place for work that is important for safety to be carried out reliably, and the related settings for improvement measures, shall be promoted as indicated below.

(1) Examinations in response to this event (method of tightening coupling nuts)

1) The torque wrench serial numbers and torque set values used for the CF34-3 and CF34-8C/8E engines were specified to be recorded in the Build Record, and operation of the procedures was started. It was also confirmed that the coupling nuts for the V2500 and CF34-10E engines have a wire-hanging structure, and that preventive measures against looseness are in place.

[Action taken in November 2013]

2) Triple torque tightening was set as an item included in regular education (lectures) and such education was carried out once again.

[Action taken in March 2014]

(2) Horizontal deployment to work items that are important for safety (specific measures in response to the recommendations)

1) In order to call particular attention to work which has been additionally marked with "CAUTION", notifications were made once again to check the "CAUTION" notation before beginning work, and an item for this was also set in the content of regular education.

[Action taken in May 2015]

2) In order to confirm whether work additionally marked with "CAUTION" can be reliably performed according to the manual, whether records indicating that it has been reliably performed can be indicated, and whether appropriate preventive measures are carried out in subsequent steps, regulations regarding processes for their implementation and approval, including the establishment of a related Committee, shall be enacted. Also, in order to ensure the application of these measures even if the "CAUTION" notation is added or revised in the manual thereafter, information regarding these regulations shall be communicated to all members of the authorized maintenance organization. Based on these regulations, re-examinations shall be performed on all work additionally marked with the "CAUTION "notation, and improvement measures shall be implemented.

[Completion report in January 2016]

*The report is published on the JTSB website.
http://www.mlit.go.jp/jtsb/airkankoku/kankoku8-1re_150701.pdf

○ Actions Taken by J-AIR Corporation in Response to the Recommendations (Completion Report)

(1) Response to "Enhance education and training involving important system functions for

safety."

The content regulated in the AOM (Aircraft Operating Manual): Emergency & Abnormal Procedures is recognized to consist of system functions that are particularly important for safety, and education to achieve mastery of this content has been implemented since the past, such as by regular training (lectures, simulator practice) and initial emergency rescue training. However, re-confirmation and thorough communication of procedures regarding system details on the special nature of situations where notification messages transition from "CAUTION" (cautionary message for malfunctions in fire detection equipment) to "WARNING" (fire alarm message), as occurred in this case, were also carried out.

In the other system functions of the CRJ equipment, and in all systems that are important for safety in the E170 equipment, there were no special situations identified where cautionary content transitions to different warning messages as occurred in this event.

[Actions Taken After this Serious Incident]

After the occurrence of this event, explanations of the applicable event were provided in "Operations News (ON-2394-JAR)" starting from the period of the 2013 fiscal year in regular training (lectures) for flight crew members of both CRJ and E170 (implemented from the training held on May 20, 2013). Due to the necessity to enhance the understanding of the fire detection system functions as soon as possible, new educational materials on "FIRE PROTECTION (CRJ)" were prepared and used in the fiscal year 2014 CRJ regular training (during lectures and simulator training) (implemented from the training held on March 2, 2014).

In addition to these trainings, "Operations News (ON-2394-JAR)" and the "Safety Awareness Improvement Study" were promptly utilized after the occurrence of the applicable incident to explain measures in response to the occurrence of such a situation in meetings participated in by all department managers, captains, and copilots in flight crew departments, and opinion exchanges were held to raise the awareness of its danger in a case study format where participants imagined the occurrence of the applicable event on their own flights. An accident involving a fire occurring on a China Airlines flight at Naha Airport on August 20, 2007 was introduced, and participants were made aware of the danger involved if a fire should break out at a parking apron near a terminal (training held from May 16 to May 31, 2013).

These initiatives resulted in all flight crew members deepening their awareness of fires occurring while on the ground, and on-site flight crew members taking steps to improve their safety awareness and risk management capabilities by repeatedly executing these procedures in accordance with the Emergency & Abnormal Procedures in the AOM, so that there will be no lessening of their ability to perform them without hesitation (started from Flight Crew Committee meeting held on May 8, 2013).

[Specific Measures in Response to the Recommendations]

Educational training materials on "FIRE PROTECTION" were newly created for the E170 equipment in addition to those for the CRJ equipment, for use in the fiscal year 2015 CRJ/E170 regular training (during lectures and simulator training) to address both models and to apply to all flight crew members. Furthermore, the content was revised so that items which previously only consisted of system explanations were expanded to cover items up to emergency escape (implemented from the March 3, 2015 training, held once a year for all flight crew members).

These recommendations provided an opportunity to review and check the safety management systems. After understanding the functions of systems important for safety in each model, the educational training was enhanced so that flight crew members for each model were able to achieve a unified awareness of danger among themselves (March 2015).
Steps will be taken to further continue and deepen the understanding of specific actions in educational training, while looking back on them to enhance it even further.

(2) Response to "Reconsider the contents of training in response to an outbreak of fires."

[Actions Taken After this Serious Incident]

In regular emergency rescue training (mockup practice), training procedures for escaping to the outside of an aircraft due to an outbreak of fire immediately before or after landing have been implemented since the past. However, in the 2013 fiscal year, engines were incorporated into this content as a cause of the fire, and this content was emphasized after the occurrence of this event (expanded to apply to all cabin attendants in addition to flight crew members) (held from May 9, 2013).
Actions in response to a fire occurring at the tires while on the ground were implemented in regular training (simulator practice) for both the CRJ and E170 equipment in fiscal year 2013. In fiscal year 2014, training in response to each of the conditions consisting of a fire occurring at the tires while on the ground for the CRJ equipment, and a fire occurring at the auxiliary power unit (APU) for the E170 equipment, were implemented.

[Specific Measures in Response to the Recommendations]

In fiscal year 2015, training in response to engine fires occurring while on the ground, simulating this incident, were specified to be implemented for both the CRJ and E170 equipment (held once a year for all crew members from March 21, 2015).
For the CRJ equipment in particular, the situation where the "CAUTION" alarm message shifts to "WARNING" was replicated in simulators, it was specified that training would be carried out in a more realistic environment to master quick action in accordance with the AOM, and such training was started (started on the same day of March 21, 2015).

The "Safety Awareness Improvement Study" materials were also reviewed after the investigation report on the aircraft serious incident was published, and are being utilized as educational training materials indicating points such as the importance of quick and accurate response to alarms, and the thorough emphasis of accurately understanding message content after quickly stopping and muting active alarms (in preparation for the developing conditions) (applied to all flight crew members from April 1, 2015, scheduled for completion by March 31, 2016).

As a part of reflections on the recommendations that were received, basic items in initial action processes, such as emergency shutdown and quick implementation of checklist procedures in the emergency situation of responding to a fire occurring while on the ground, in addition to requesting emergency rescue from external organizations (air traffic control, etc.), were thoroughly carried out in the form of briefings before and after practical training (simulator training), to once again check the knowledge and awareness of participants (implemented from March 21, 2015).

(3) Other

Improvements combining the review and enhancement of educational training with increased speed in responding to alarm messages and thorough assurance of confirming their content, in items (1) and (2) above, will be indicated specifically in guidelines on implementing training for instructors as a form of training to instill an awareness of danger, with the results of their implementation evaluated to closely identify any items for improvement in the future on a continuing basis.

*The completion report is published on the JTSB website.
http://www.mlit.go.jp/jtsb/airkankoku/kankoku8-2re_150701.pdf

2 Opinions

Opinions on the improvement of safety of the freight train operation

(Opinions on December 17, 2015)

The three derailment accidents by the freight train, which occurred from April, 2012, to June, 2014 at Esashi Line, have the common situation such as that the outer rail side wheels of the freight wagon in the freight train running in relatively sharp curve near the limited speed, derailed by flange climbing.

As the probable causes for each accident were described in each investigation report, it was probable that these accidents were caused by complex combination of the factors, such as vehicle, track, loading of the freight etc., although their effected levels were different.

In addition, the Japan Transport Safety Board analyzed the issues to be dealt with cooperation by the parties concerned towards the improvement of the safety and the prevention of the derailment accidents of the freight train due to the complex combination of the factors such as vehicle, track, freight loading, etc., based on the knowledge obtained from the previous investigations, integrating the investigated results of these three derailment accidents of the freight train occurred in Esashi Line. (Refer to the attachment.)

The railway system is the integration of the various technology area, such as civil engineering, vehicle technology, electric engineering, operation, etc. Hence, the interested parties of the freight railway transportation, such as the passenger railway operators charged with track maintenance, the freight railway operators charged with vehicle management and operation etc., the freight transporters and the freight senders charged with loading freight and the railway vehicle makers manufacturing the freight wagons, are related with each other.

So that, in view of the results of these accident investigations, the Japan Transport Safety Board expresses its opinion as follows to the Minister of Land, Infrastructures, Transport and Tourism, pursuant to Article 28 of the Act for Establishment of the Japan Transport Safety Board in order to promote the parties concerned to consider the issues analyzed by the Board to improve safety for the

freight train operation.

Here, when some measures were implemented according to the following opinions, please notify the Board.

1. Let the context of the accident investigation reports about the three derailment accidents of freight train occurred in Esashi Line and the attached Opinion, well known widely, to the railway operators provided tracks to freight train operation, freight railway operators, freight transporters using freight trains, railway vehicle manufacturers, etc.
2. To supervise and guide the railway operators based on the laws and ordinances, to implement smoothly the required measures for prevention of recurrence described in each accident investigation report.

3. To promote the persons concerned in railway operators, railway vehicle manufacturers, freight transporters using freight trains, freight senders, research and development organization, etc., to investigate in cooperated with each other, about the issues related with vehicles such as design of freight wagon, issues related with track such as track category and track technology in each section, issues related with freight such as loading methods, etc., towards the improvement of safety for the freight train operation.

(Attachment)

Summary

Three derailment accidents of the freight train occurred in Esashi Line, from April, 2012, to June, 2014. It is probable that these accidents were caused by complex combination of the factors, such as vehicle, track, loaded freight, etc.

To prevent recurrence of the same sort of the accidents and to improve running safety of freight train further, it is required for the parties concerned in railway operators providing their tracks for freight train operation, freight train operators, freight transporters using freight trains, freight senders, railway vehicle manufacturers, research and development organizations, etc., in cooperated with each other, to grapple with issues related with vehicles such as design methods of suspension device for freight wagons, issues related with tracks such as maintenance methods for track irregularity, and issues related with loading freights such as the loading methods considering prevention of unbalanced loading and height of the gravity center of freights etc., based on the analyzed results during investigation of the derailment accidents in Esashi Line, and obtain appropriate margins against derailment as a whole. The Ministry of Land, Infrastructure, Transport and Tourism is expected to implement the proper management to promote these activities steadily.

1. Preface

A series of derailment accidents of freight trains composed of container-carrying wagons, occurred in Esashi Line, denoting in the following text as "the Esashi Line derailment accidents" which is a set of three accidents, i.e., "Esashi I" accident occurred on April 26, 2012[1], "Esashi II"

accident occurred on September 11, 2012[2], and "Esashi III" accident occurred on June 22, 2014[3], have the common situation that the outer rail side wheels of the freight wagon in the freight train running in relatively sharp curve at near the limited speed, derailed by flange climbing, denoting as “Flange climb derailment accidents of freight wagon”, in the following text. As the probable causes of these accidents are described in each investigation report, it is probable that these accidents were caused by complex combination of the factors, such as vehicle, track, loading freight etc.

The results of analyses about "the Esashi Line derailment accidents" and the similar accidents occurred in the past, and the issues towards measures to prevent recurrence of the accidents required to examine in the future, are shown in the following text.

(Refer to the Attached table "Summary of the Esashi Line derailment accidents")

2. Flange climb derailment accidents of freight wagon and alredy implemented measures to prevent derailment

Figure 1 shows the data about flange climb derailment accidents and the similar accidents occurred after 1952[4]-[6]. The flange climb derailment accidents of freight wagons at main tracks had occurred frequently until around 1980, and probable causes of these accidents were determined as combination of various factors while the vehicles and the tracks were maintained within the criterion values for control, and so called as "multiple-factor derailments". The Tsurumi accident, occurred in Tokaido Main Line in November, 1963, was the multiple collision accident originated by derailment of freight wagon, and became to the disastrous accident killing 161 people. To respond this accident, Japan national railway, at that time, established the investigate committee to conduct a variety of examination including on-track tests, and implemented the measures to prevent multi-factor derailments from the view points of both vehicle and track[7], i.e., softened spring constants of the secondary suspension of the TR-41 series bogie, remodeled to use with oil dampers, added the combination of alignment and cross-level to the items in the management of track irregularity, etc. As the results of implementation of these measures, there was no multiple-factor derailment accident after 1982, however, in recent years, the same sort of derailment accidents came to happen again.

As shown in Table 1, seven accidents of the same sort of derailment occurred from 1998 to the present, and the recent three accidents occurred at Esashi Line. Here, Esashi Line became to the track section where freight trains run very frequently after connected with Kaikyo Line in 1988, has the features that there are many relatively sharp curves. Generally, margins against derailment is reduced in the curved section of small radius with large track irregularity, then it is somewhat likely that there were the trends liable to reduce margins against derailment in Esashi Line, compared with the other section. Here, although further precise analyses are needed, it is required to investigate on the same sort of derailment in the track sections where freight trains are operated, as it is considered that these situation is not peculiar to Esashi Line only.

The types of the derailed freight wagons were Ko-Ki 106, Ko-Ki 107 and Ko-Ki 200*. All of them are relatively new type freight wagons manufactured after 1997, i.e., the first Ko-Ki 106 type freight wagon was manufactured in 1997, the first Ko-Ki 200 type wagon was manufactured in 2000, and the first Ko-Ki 107 type wagon was manufactured in 2006.

* "Ko-Ki" : "Ko" means freight wagon for containers, "Ki" means loading capacity over 25 tons.

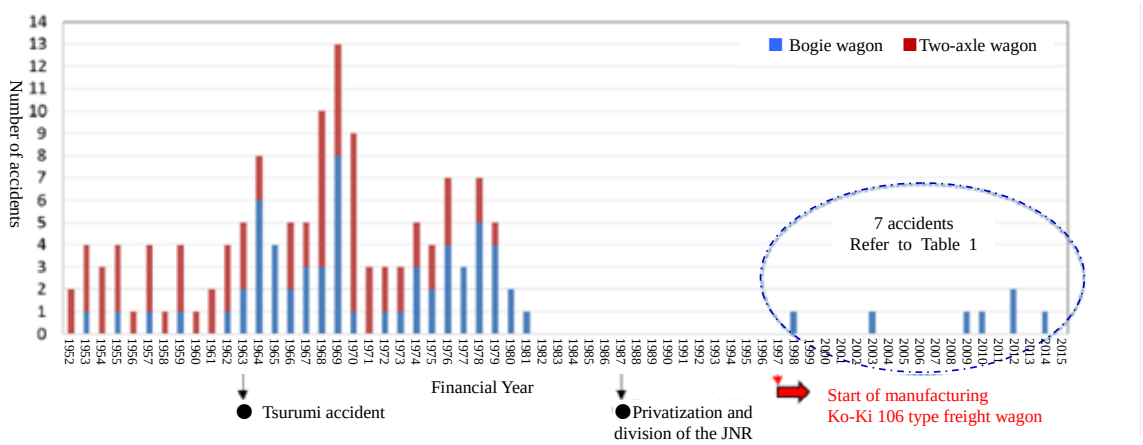


Figure 1 Changes of flange climb derailment and similar derailment accidents of freight wagon.

Table 1 Recent flange climb derailment accidents of freight wagon

No	Date of accident	Line name	Accident site	Wagon type	Velocity	Radius of curve	Operators * (vehicles - track)	Remarks
1	Aug. 26, 1998	San-yo Line	Between Seno station and Hachihommatsu station	Ko-Ki 106	55 km/h	300 m	JR Freight - JR West	
2	May 22, 2003	Tokaido Line	In the premises of Tokyo Freight Terminal station	Ko-Ki 106	42 km/h	About 268 m	JR Freight -JR Freight	# Simple turnout No.12
3	Dec. 19, 2009	Nippo Line	Between Sotaro station and Ichitana station	Ko-Ki 200	60 km/h	300 m	JR Freight - JR Kyushu	
4	Mar. 10, 2011	Narita Line	Between Kuzumi Station and Namegawa station.	Ko-Ki 200	57 km/h	406 m	JR Freight - JR East	
5	Apr. 26, 2012	Esashi Line	Between Izumisawa station and Kamaya station	Ko-Ki 107	57 km/h	300 m	JR Freight - JR Hokkaido	“Esashi I”
6	Sept. 11, 2012	Esashi Line	Between Kamaya station and Izumisawa station	Ko-Ki 106	59 km/h	300 m	JR Freight - JR Hokkaido	“Esashi II”
7	Jun. 22, 2014	Esashi Line	Between Izumisawa station and Satsukari station	Ko-Ki 107	63 km/h	350 m	JR Freight - JR Hokkaido	“Esashi III”

* JR Freight : Japan Freight Railway Company, JR West : West Japan Railway Company, JR East : East Japan Railway Company, JR Kyushu : Kyushu Railway Company, JR Hokkaido : Hokkaido Railway Company.

3. Toward prevention of recurrence.

It is probable that the Esashi Line derailment accidents were caused by complex combination of the factors, such as vehicle, track, loading freight etc., as their degrees of influence differ in each accident. In this chapter, analyses are implemented about issues to be investigated, related with vehicle, track, and loading freight, that the party concerned should grapple in cooperated with each other, to improve margins against derailment as a whole, to prevent recurrence of the same sort of the accidents and further improvement of running safety of the freight train, based on the analyzed results about vehicles, track, and loading freight in the Esashi Line derailment accidents.
[Refer to the Attached diagram “Factors of the Esashi Line derailment accidents and their degrees of influence, etc.”]

3.1 Issues related with vehicles.

According to investigation results about the accidents “Esashi II” and “Esashi III”, it was found that Ko-Ki 106 type freight wagons and wagons manufactured after that still used coil spring type secondary suspension with enlarged spring constant as to load heavy international ISO standard type

containers, etc., under restriction of height of the couplers, responding the needs such as higher efficiency, faster speed, and internationalization in the freight transport market, while the bolster dampers were designed to select conventional devices aiming to use common parts.

When the freight wagons of these types run on the track where there is combination of alignment and cross-level having the property to excite rolling motion of vehicle bodies largely, there are the cases to decrease running safety by the significantly decreased dynamic wheel loads due to enlarged rolling notion of the vehicle body, compared with the freight wagons equipped with smaller spring constant type secondary suspensions [8]-[12]. It was found from the investigation results of the accident “Esashi II”, that there exists “the disadvantageous situation against running safety”, in which the damping characteristics of the bolster damper could not demonstrate its ability well according to situation of loaded freight, and this trends become remarkable especially in Ko-Ki 106 type freight wagons and wagons manufactured after that. Here, in the “Esashi II” accident, it is probable that the freight wagon derailed by the combination of relatively large combination of alignment and cross-level in relatively sharp curve, relatively light loaded freight and their gravity center was in higher position, in addition to above mentioned factors.

Then, as for the vehicle, the parties concerned should investigate to use the suspension device with proper damping characteristics and to equip suspension device which can obtain proper damping characteristics regardless of quantity of loaded freight, referring to methods of freight loading and situation of the track section where freight trains are operated, etc., to realize safe operation of the concerned freight wagons with proper margins against running safety.

3.2 Issues related with Tracks

It is considered that the decreased wheel load promoted by the large combination of alignment and cross-level will effect relatively large as the factors related to tracks in the probable causes of the flange climb derailment accidents of freight wagons.

The management system for combination of alignment and cross-level was investigated and implemented for bogie wagons using TR41 series bogie or two-axle wagons of Wa-La-1 type, etc., as one of the measures preventing recurrence of multiple-factor derailment described in the above Chapter 2, and was introduced in around 1980, in almost the same contents with the present system. The present management system can be estimated as effective at a certain level, because the multiple-factor derailment accidents were extremely reduced after the present management system was introduced, and the similar accidents did not happen until recent years, provided that the freight wagons, which were the target of improvement at that time, became not in use at present.

On the other hand, a part of flange climb derailment accidents of freight wagons, occurred in recent years, were caused by the combination of alignment and cross-level which were not satisfied the values of the maintenance standard. It is suggested that there is the possibility to reduce margins for safety by the management methods covered by the present management system of combination of alignment and cross-level, provided that there are the other factors than the track, for example, unbalance of loaded freight in the accident "Esashi I" and lack of damping in suspension device in the accident "Esashi II".

Then, in the issues related with track, in addition to implement proper management of combination of alignment and cross-level based on the present management system, including general measures such as investigation about the range to install guard angle, the parties concerned in railway operators and research institutes are required to investigate the management system of

track irregularity in the section where freight trains are operated, considering the characteristics of freight wagons based on characteristics of track section and loading methods of freight loads.

3.3 Issues related with loading freight

In the issues related with loading freight, there are issues such as unbalanced loading of freight and height of the gravity center of loaded freight.

As for the unbalanced loading of freight, the following measures are described in the investigation report about “Esashi I” accident, these are, Japan Freight Railway Company asked the transport operators using railway to let noticed their employees well the context of the contract on freight transport such as prevention of unbalanced loading and confirmation of loaded status, and Japan Freight Railway Company will confirm the status of loaded freight in corporation with the transport operators using railway, from viewpoints of preventing unbalanced loading in the containers to avoid large unbalance of static wheel weight in freight wagons. In response to these activities, at present, the Ministry of Land, Infrastructure, Transport and Tourism and the operators concerned established "Investigation meeting on measures against unbalanced loading in railway freight transport", and the measures at a certain level were implemented based on the intermediate summaries of the meeting.

As for the height of the gravity center of loaded freight, it was found by the investigation results on the accident "Esashi II" that there is the case that rolling motion of the vehicle can not be damped well by poor damping characteristics when the weight of loaded freight is relatively light, due to the switching condition of damping characteristics of the bolster damper of freight wagons, and the margins against derailment will be reduced when the gravity center of vehicle body is high even when weight of loaded freight is relatively light, in these situation.

Then, as for the issues related with loading freight, the "Investigation Committee on measures against unbalanced loading in railway freight transport" is expected to investigate successively about introduction of the system that can detect easily the unbalance of wheel weight of the wagon loaded containers, in addition to the measures to prevent unbalanced loading. Furthermore, the meeting is also required to investigate the loading methods considering weight and the height of the gravity center of loaded freight, adding the characteristics of the freight wagon in operation.

4. Conclusion

Railway is the integrated system of various technology areas, such as civil engineering, vehicle technology, electric engineering, operation, etc., then it is very important to obtain safe operation that every technology divisions corporate with each other. In the railway freight transportation, the passenger railway operators charged with track maintenance etc., the freight railway operators charged with vehicle management and operation etc., the freight transporters and the freight senders charged with loading freight, and the railway vehicle makers manufacturing the freight wagons, are related.

After this, the research institutes in addition to these parties concerned with freight transport are requested to grapple with each other towards the further improvement of running safety of freight trains, obtaining proper margins against derailment as the whole, considering possibilities of realization based on the status of characteristics and operation of freight wagons, and the status of track maintenance etc., in the investigation of various issues including the issues analyzed in the previous Chapter 3. Ministry of Land, Infrastructure, Transport and Tourism is expected to take

proper responses to promote steady implementation of these activities.

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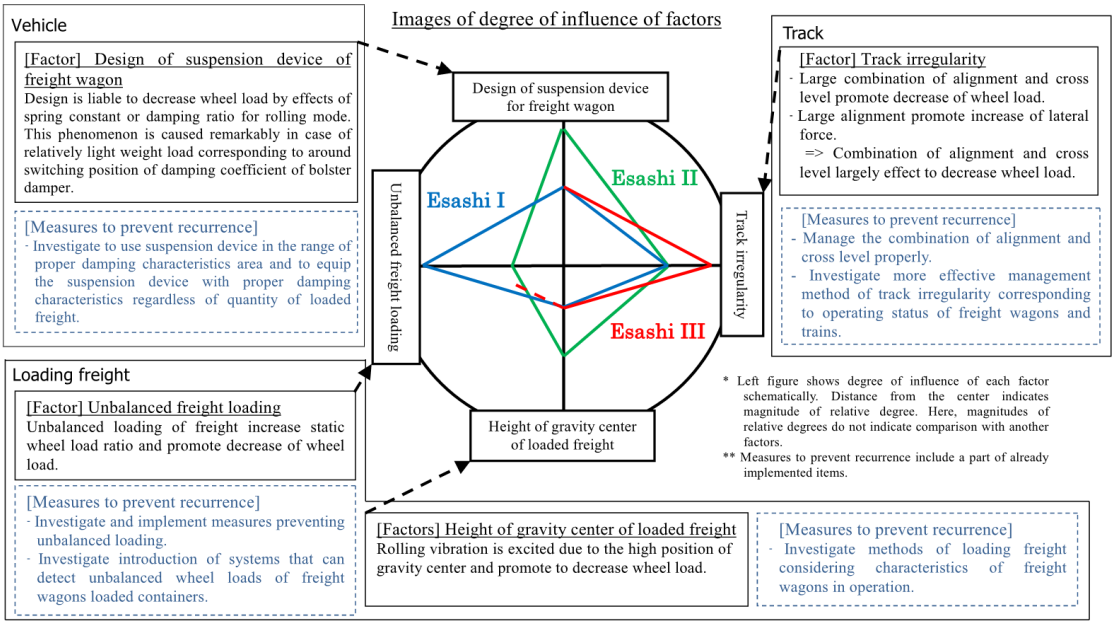
Attached table. Summary of the Esashi Line derailment accidents

	Esashi-I (Occurred on April 26, 2012)	Esashi-II (Occurred on September 11, 2012)	Esashi-III (Occurred on June 22, 2014)
Track	Left curve of 300m radius with 100mm cant.	Right curve of 300m radius with 100mm cant.	Left curve of 350m radius with 90mm cant.
	Enhancement of track strength and minor improvement of track shapes were implemented in the construction works improving Esashi Line from class 4 (Hei) to class 2, along with connection to Kaikyo Line.		
Wagon type	Ko-Ki 107 type	Ko-Ki 106type	Ko-Ki 107 type
Derailed vehicle	18th vehicle of 20 vehicle train set.	9th vehicle of 21 vehicle train set.	20th vehicle of 21 vehicle train set.
First derailed axle	Front axle in the rear bogie (3rd axle)	Front axle in the rear bogie (3rd axle)	Front axle in the rear bogie (3rd axle)
Velocity	About 57 km/h	About 59 km/h	About 63 km/h
Probable causes	It is probable that the outside rail side wheel climbed up to the top of the rail and derailed, due to the increased derailment coefficient for the outside wheel, because the lateral force acting on the outside wheel had increased by the increased wheel load of the inside wheel, and the wheel load of the outside wheel had decreased, due to the large unbalance in the static wheel loads between right and left wheels of the freight wagon loaded containers, compared to the wagon with balanced static wheel load, while the train passed in the curved track of 300m radius, in this accident. It is highly probable that the unbalanced loading in the containers caused the large unbalance in the static wheel loads in the derailed freight wagon. In addition, it is somewhat likely that the combination of alignment and cross-level, which should be managed in the section where freight trains are operated, had relatively large at the point before the wheel started to climb up, promoted the decrease of wheel load of the outside wheel.	It is probable that the accident occurred because wheel loads of outer rail side wheel in the first axle in the rear bogie of the Ko-Ki 106 type freight wagon was decreased at around the accident site, while the train passed the 300 m radius right curved track, and the wheel climbed up the outer rail and derailed. It is probable that the wheel load acting on the outer rail side wheel reduced by a large rolling vibration of the freight wagon running around the accident site. Although statuses of the train operation, the maintenance of the vehicles and the railway track were implemented in accordance with the regulations of Japan Freight Railway Company and Hokkaido Railway Company, established based on the ministerial ordinance, it is probable that the freight wagon vibrated in rolling mode significantly by the combination of the following factors. [1] The specification of the suspension device of the Ko-Ki 106 type freight wagon was that the rolling motion of the vehicle body would not converged in a short time, as the damping was small compared to the Ko-Ki 104 type freight wagon, when the loaded weight is relatively light. [2] The load was relatively light and the center of gravity of the freight wagon was in a high position. [3] The combination of alignment and cross-level at around the accident site, which were relatively large as close to their maintenance standard values, and were distributed along the track including the wave length components liable to introduced rolling motion of the body against the train velocity, had possibilities to promote the generation of rolling motion of the body.	It is somewhat likely that the accident occurred as the outer rail side, right, wheel of the Ko-Ki 107 type freight wagon, climbed up the rail and derailed to right because the derailment coefficient increased due to the decrease of the wheel load and increase of the lateral force for the outer rail side, right, wheel, as the body of the freight wagon was excited to vibrate in rolling mode significantly while the train was running in the 350 m radius left curved track. It is probable that the significant roll vibration was excited to the vehicle body due to the existence of the large combination of alignment and cross-level which should be maintained, in the track before the point where the wheel started climbing up the rail. It is somewhat likely that the existence of the large alignment to shorten the radius of curvature effected to increase the lateral force in the outer rail side wheels. It is somewhat likely that the large combination of alignment and cross-level which should be maintained had existed because the on-site track maintenance section could not understand the existence of the plural kinds of the combination of alignment and cross-level measured by the high speed track inspection car, and these situation was caused in relation with the improper method to decide the necessity of the maintenance work by communication of the inspected results to the on-site track maintenance section, and a lack of the knowledge about the combination of alignment and cross-level in the on-site track maintenance section. Although it could not be determined whether the unbalanced loading actually related to the occurrence of derailment, it is somewhat likely that the status of loading just before the accident became to a factor to promote derailment.

Attached diagram. Factors of the Esashi Line derailment accidents and their degrees of influence, etc.

○ A series of the derailment accidents of freight trains occurred in Esashi Line have the common situation that the outer rail side wheels of the freight wagon in the freight train running in relatively sharp curve at near the limited speed, derailed by flange climbing.
○ It is somewhat likely that these accidents were caused by the combination of the factors such as vehicles, track, and loading freight, etc., in the worse direction, while each factor would not cause the derailment.
○ Here, degrees of influence of the factors to a series of derailment accidents differ as shown in the followings.



Chapter 2 Summary of major investigation activities in 2015

1 Statistics of accident investigation activities

In the case of occurrence of aircraft, railway, or marine accidents, the JTSB designates an investigator-in-charge and accident investigators who begin investigations to determine their causes. Since we can never know when or where accidents may occur, the personnel of the Board, including accident investigators, are making continuous efforts to be able to conduct investigation activities immediately when accidents should occur.

Various accidents occurred in 2015.

Regarding aircraft, 27 accidents occurred, such as an accident where an Airbus A320-200 operated by Asiana Airlines, Inc. veered off a runway at Hiroshima Airport while landing, leading to injuries for the passengers and crew in April; and the crash of a privately-owned Piper PA-46-350P into a residential area in Chofu City, Tokyo, catching fire and leading to casualties for people on board and residents of the area in July. We conducted 49 investigations during the past year, including the ongoing 22 investigations from the previous year. In addition, 9 serious incidents occurred, such as a serious incident that occurred on a runway of Naha Airport involving a Boeing 737-400 operated by Japan TransOcean Air Co., Ltd., a Boeing 737-800 operated by All Nippon Airways Co., Ltd., and a CH47 operated by the Japan Air Self-Defense Force in June. We conducted 23 serious incident investigations during the past year, including the ongoing 14 investigations from the previous year.

Of these we have published the investigation reports of 18 accidents and 11 incidents that completed the investigations.

Of the investigation reports that were published, we made recommendations to IHI Corporation and J-Air Co., Ltd. on the serious incident of a Bombardier CL-600-2B19 operated by J-Air Co., Ltd.
(For details, please refer to “Chapter 1: Summary of Recommendations and Opinions Issued in 2015”, page 2.)

Regarding railways, 13 accidents occurred, such as the derailment of an East Japan Railway Company train on the Yonesaka Line between Uzen-Numazawa Station and Tenoko Station after climbing up snow that had accumulated on the tracks in January. We conducted 31 investigations during the past year, including the ongoing 18 investigations from the previous year. In addition, 3 serious incidents occurred, such as an incident where an electrification pole scheduled for removal fell onto and obstructed the tracks of the East Japan Railway Company Yamanote Line and Keihin Tohoku Line between Kanda Station and Akihabara Station. We conducted 5 serious incident investigations during the past year, including the ongoing 2 investigations from the previous year.

Of these we have published the investigation reports of 18 accidents and three incidents that

completed the investigation.

Of the investigation reports that were published, we stated our opinions to the Minister of Land, Infrastructure, Transport and Tourism based on the results of investigations into the derailment of a Japan Freight Railway Company train on the Esashi Line between Kamaya Station and Izumisawa Station that occurred on September 11, 2012, and 2 other derailment accidents occurring on the Esashi Line.
(For details, please refer to “Chapter 1: Summary of Recommendations and Opinions Issued in 2015”, page 7.)

Regarding marine, 793 accidents occurred, such as the fire on passenger ship Funada in April, and the fire on passenger ferry Sunflower Daisetsu in July. We conducted 1,475 investigations during the past year, including the ongoing 688 investigations from the previous year and excluding six non-applicable accidents due to the results of the initial investigations. Moreover, 106 incidents occurred; consequently, we conducted 192 investigations during the past year, including the ongoing 87 investigations from the previous year and excluding one non-applicable incident due to the result of the initial investigation.

(Provided by Japan Coast Guard)

Of these we have published the investigation reports of 862 accidents and 126 incidents that completed the investigation.

Accident investigators conduct investigations and invite comments from parties relevant to the cause of the accident; accordingly, they make draft recommendations or opinions regarding the measures to be taken to prevent the recurrence of accidents and to mitigate damage caused by accidents. Therefore, they shall endeavor to improve their level of skill and knowledge by participating in national and international training; moreover, they share accident information among international society by attending international conferences.

In the future, we will continue to carry out thorough investigations into the causes of aircraft, railway, and marine accidents, and will publish our investigation reports as soon as possible. Based on the results of our investigations, who will also make recommendations and state our opinions as necessary to related government institutions and parties relevant to the causes of accidents to prevent the recurrence of accidents.

Chapter 3 Aircraft accident and serious incident investigations

1 Aircraft accidents and serious incidents to be investigated

<Aircraft accidents to be investigated>

◎Paragraph 1, Article 2 of the Act for Establishment of the Japan Transport Safety Board(Definition of aircraft accident)

The term "Aircraft Accident" as used in this Act shall mean the accident listed in each of the items in paragraph 1 of Article 76 of the Civil Aeronautics Act.

◎Paragraph 1, Article 76 of the Civil Aeronautics Act (Obligation to report)

1 Crash, collision or fire of aircraft;
2 Injury or death of any person, or destruction of any object caused by aircraft;
3 Death (except those specified in Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism) or disappearance of any person on board the aircraft;
4 Contact with other aircraft; and
5 Other accidents relating to aircraft specified in Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism.

◎Article 165-3 of the Ordinance for Enforcement of the Civil Aeronautics Act

(Accidents related to aircraft prescribed in the Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism under item 5 of the paragraph1 of the Article 76 of the Act)

The cases (excluding cases where the repair of a subject aircraft does not correspond to the major repair work) where navigating aircraft is damaged (except the sole damage of engine, cowling, engine accessory, propeller, wing tip, antenna, tire, brake or fairing).

<Aircraft serious incidents to be investigated>

◎Item 2, Paragraph 2, Article 2 of the Act for Establishment of the Japan Transport Safety Board (Definition of aircraft serious incident)

A situation where a pilot in command of an aircraft during flight recognized a risk of collision or contact with any other aircraft, or any other situations prescribed by the Ordinances of Ministry of Land, Infrastructure, Transport and Tourism under Article 76-2 of the Civil Aeronautics Act.

◎Article 76-2 of the Civil Aeronautics Act

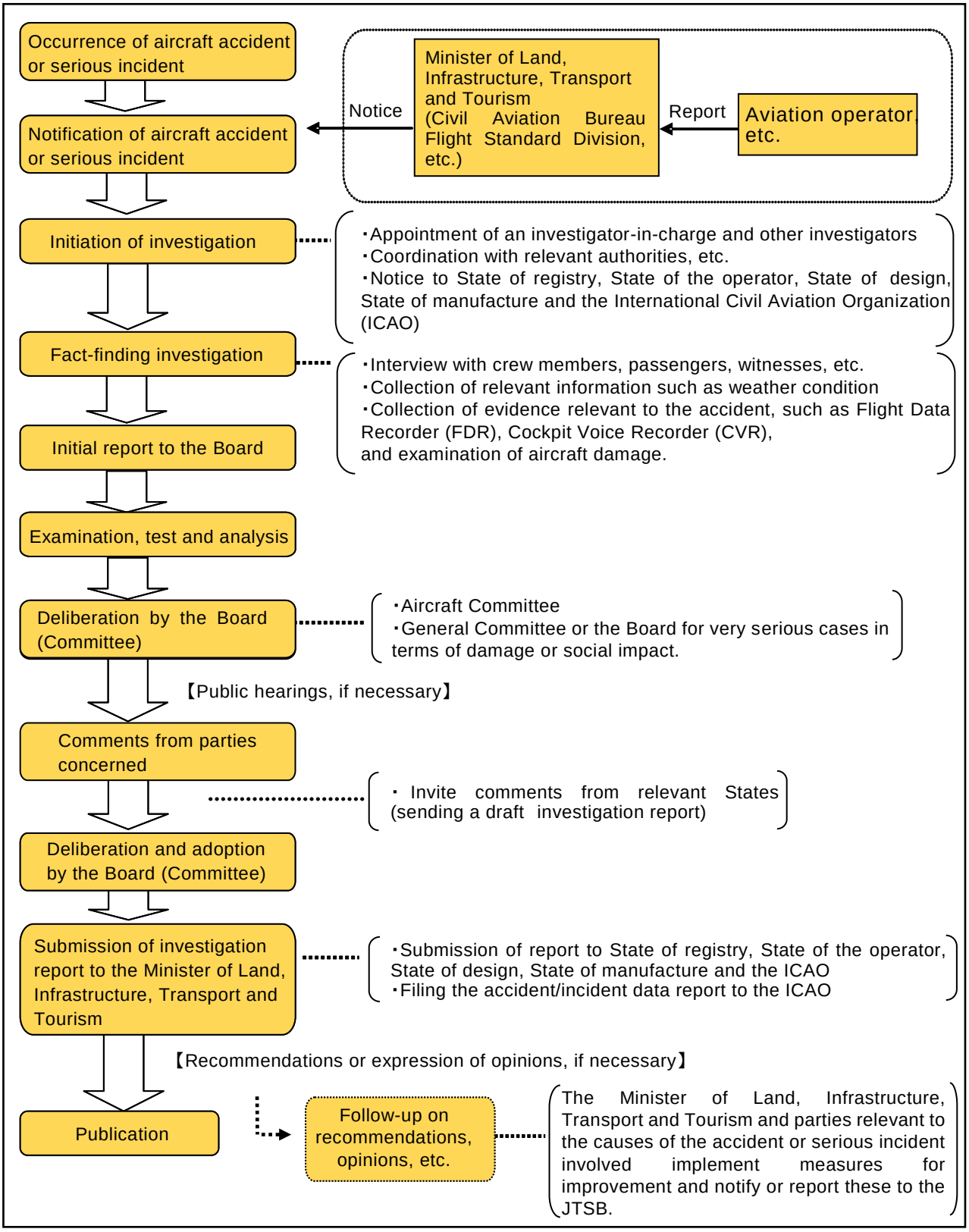
・When the pilot in command has recognized during flight that there was a danger of collision or contact with any other aircraft.

・When the pilot in command has recognized during flight that there is a danger of causing any of accidents listed in each item of paragraph 1, article 76 of the Civil Aeronautics Act, specified by Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism.

◎**Article 166-4 of the Ordinance for Enforcement of the Civil Aeronautics Act** (The case prescribed in the Ordinances of the Ministry of Land, Infrastructure, Transport and Tourism under Article 76-2 of the Civil Aeronautics Act)

1 Take-off from a closed runway or a runway being used by other aircraft or aborted take-off
2 Landing on a closed runway or a runway being used by other aircraft or attempt of landing
3 Overrun, undershoot and deviation from a runway (limited to when an aircraft is disabled to perform taxiing)
4 Case where emergency evacuation was conducted with the use for emergency evacuation slide
5 Case where aircraft crew executed an emergency operation during navigation in order to avoid crash into water or contact on the ground
6 Damage of engine (limited to such a case where fragments penetrated the casing of subject engine
7 Continued halt or loss of power or thrust (except when the engine(s) are stopped with an attempt of assuming the engine(s) of a motor glider) of engines (in the case of multiple engines, 2 or more engines) in flight
8 Case where any of aircraft propeller, rotary wing, landing gear, rudder, elevator, aileron or flap is damaged and thus flight of the subject aircraft could be continued
9 Multiple malfunctions in one or more systems equipped on aircraft impeding the safe flight of aircraft
10 Occurrence of fire or smoke inside an aircraft and occurrence of fire within an engine fire-prevention area
11 Abnormal decompression inside an aircraft
12 Shortage of fuel requiring urgent measures
13 Case where aircraft operation is impeded by an encounter with air disturbance or other abnormal weather conditions, failure in aircraft equipment, or a flight at a speed exceeding the airspeed limit, limited payload factor limit operating altitude limit
14 Case where aircraft crew became unable to perform services normally due to injury or disease
15 Case where a slung load, any other load carried external to an aircraft or an object being towed by an aircraft was released unintentionally or intentionally as an emergency measure
16 Case where parts dropped from aircraft collided with one or more persons
17 Case equivalent to those listed in the preceding items

2 Procedure of aircraft accident/incident investigation



3 Statistics of investigations of aircraft accidents and serious incidents

The JTSB carried out investigations of aircraft accidents and serious incidents in 2015 as follows: 22 aircraft accident investigations had been carried over from 2014, and 27 accident investigations newly launched in 2015. 18 investigation reports were published in 2015, and thereby 31 accident investigations were carried over to 2016.

14 aircraft serious incident investigations had been carried over from 2014, and nine serious incident investigations newly launched in 2015. 11 investigation reports were published in 2015, and thereby 12 serious incident investigations were carried over to 2016.

Among the 29 reports published in 2015, one was issued with recommendations.

Investigations of aircraft accidents and incidents in 2015

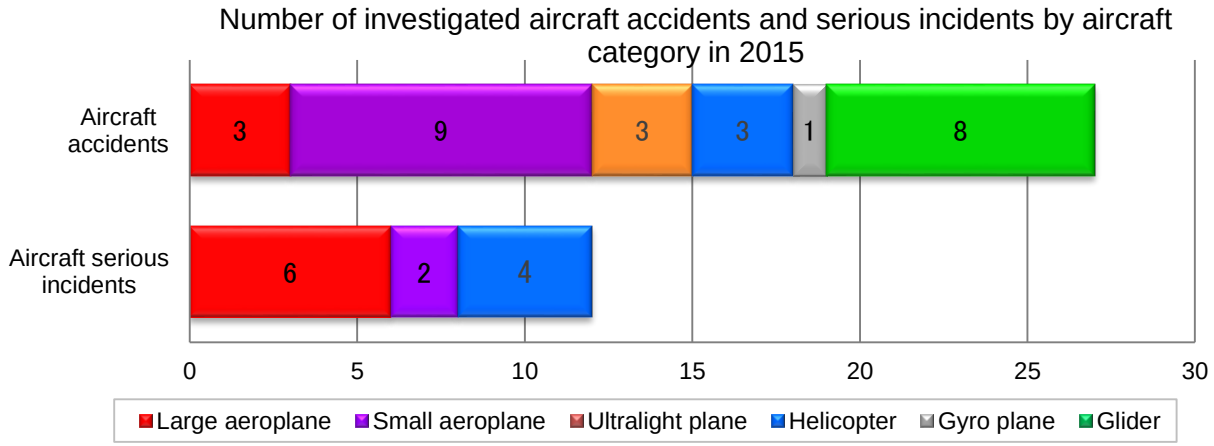
(Cases)

Category	Carried over from 2014	Launched in 2015	Total	Published investigation reports	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2016	(Interim report)
Aircraft accident	22	27	49	18	(0)	(0)	(0)	31	(0)
Aircraft serious incident	14	9	23	11	(1)	(0)	(0)	12	(0)

4 Statistics of aircraft accident and serious incident investigations launched in 2015

The number of aircraft accident and serious incident investigations launched in 2015 included 27 aircraft accidents, up 10 cases from 17 cases for the previous year, and nine aircraft serious incidents, up five cases from four cases for the previous year.

By aircraft category, three of the accidents involved large aeroplanes and nine other cases concerned small aeroplanes, while three ultralight planes, three helicopter, one gyro plane and eight gliders were involved in the remaining cases. The aircraft serious incidents included six case involving large aeroplane, two case involving small aeroplane, and four cases involving helicopters.



* Large aeroplane refers to an aircraft of a maximum take-off mass of over 5,700 kg.
* Small aeroplane refers to an aircraft of a maximum take-off mass of under 5,700 kg except for Ultralight plane.

In the 27 aircraft accidents, the number of casualties was 52, consisting of 10 deaths and 42 injured persons.

Statistics of number of casualties (aircraft accident)

(Persons)

2015							
Aircraft category	Dead		Missing		Injured		Total
	Crew	Passengers and others	Crew	Passengers and others	Crew	Passengers and others	
Large aeroplane	0	0	0	0	2	25	27
Small aeroplane	1	2	0	0	1	8	12
Ultralight plane	1	1	0	0	1	0	3
Helicopter	2	2	0	0	0	1	5
Glider	1	0	0	0	3	1	5
Total	5	5	0	0	7	35	52
	10		0		42		

5 Summaries of aircraft accidents and serious incidents which occurred in 2015

The aircraft accidents and serious incidents which occurred in 2015 are summarized as follows: The summaries are based on information available at the start of the investigations and therefore, may change depending on the course of investigations and deliberations.

(Aircraft accidents)

1	Date and location of accident	Operator	Aircraft registration number and aircraft type
	February 27, 2015 YOMIURI KAZO GLIDING FIELD, SHINKAWA-DORI, KAZO CITY, SAITAMA PREFECTURE, JAPAN	Private	SCHEMPP-HIRTH DISCUS b (GLIDER), JA2531
	Summary	The aircraft took off from Yomiuri Kazo Glider Field for a familiarization flight, and when landing on the same glider field, it made a hard landing and was damaged. A pilot was on board the aircraft, but no one sustained injuries.	

2	Date and location of accident	Operator	Aircraft registration number and aircraft type
	March 6, 2015 KIHOKU TOWN, KITAMURO GUN, MIE PREFECTURE, JAPAN	SHIN NIHON HELICOPTER CO., LTD.	AEROSPATIALE AS332L1 (ROTORCRAFT), JA6741
	Summary	After transportation of cargo suspending outside of the aircraft, when leaving and climbing from hovering at the loading site of forward base for fuel supply in Kii-Nagashima temporary helipad around 10:51 Japan Standard Time (JST: UTC +9 hours, all times are indicated in JST on a 24-hour clock), the helicopter collided with power transmission lines and crashed into the inclined surface of mountains. A captain and an on-board mechanic were on board and both of them were fatally injured. The Helicopter was destroyed and a fire broke out.	

3	Date and location of accident	Operator	Aircraft registration number and aircraft type

	March 13, 2015 AT AN ALTITUDE OF APPROXIMATELY 2,000 m NEAR NIIGATA AIRPORT, NIIGATA PREFECTURE	CIVIL AVIATION BUREAU OF THE MINISTRY OF LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM	GULFSTREAM AEROSPACE G-IV (LARGE AEROPLANE), JA001G
	Summary	During the flight after taking off from Obihiro Airport, the aircraft was struck by lightning near the location referred to above. After this, the flight was continued and the aircraft landed at Tokyo International Airport.	
4	Date and location of accident	Operator	Aircraft registration number and aircraft type
	April 14, 2015 HIROSHIMA AIRPORT, HIROSHIMA PREFECTURE	ASIANA AIRLINES, INC.	AIRBUS A320-200 (LARGE AEROPLANE), HL7762
	Summary	When landing at Hiroshima Airport, the aircraft veered off the runway and stopped in a grass field on the south side of the runway. 25 passengers and two cabin attendants sustained injuries.	
5	Date and location of accident	Operator	Aircraft registration number and aircraft type
	APRIL 26, 2015 ON THE RUNWAY OF NIRASAKI CITY, YAMANASHI PREFECTURE NIRASAKI GLIDING FIELD	Private	SCHEIBE SF34B (GLIDER), JA2446
	Summary	The aircraft took off from Nirasaki Gliding Field, and when landing on the same gliding field, its left wing tip came into contact with the ground, causing the aircraft to spin around and came to a stop. Two persons on board sustained injuries.	
6	Date and location of accident	Operator	Aircraft registration number and aircraft type
	APRIL 26, 2015 KAGOSHIMA AIRPORT, KAGOSHIMA PREFECTURE	Private	CESSNA 172RG, (SMALL AEROPLANE), JA3857
	Summary	The aircraft took off from Iwami Airport for a familiarization flight, and when landing at Kagoshima Airport, it made a belly landing and was damaged.	
7	Date and location of accident	Operator	Aircraft registration number and aircraft type
	MAY 1, 2015 NYUKAWA-CHO, TAKAYAMA CITY, GIFU PREFECTURE, JAPAN	Private	GROB MODEL GROB G109B (MOTOR GLIDER), JA2569
	Summary	A pilot and one passenger were on board the aircraft, which took off from Hida Air Park in Takayama City for a leisure flight. When it neared Mount Norikura, the aircraft collided with a slope of the mountain ahead of it and was damaged.	
8	Date and location of accident	Operator	Aircraft registration number and aircraft type
	MAY 17, 2015 AT FUKUSHIMA SKY PARK, FUKUSHIMA CITY, FUKUSHIMA PREFECTURE	Private	HOFFMANN H-36 DIMONA (MOTOR GLIDER), JA2406
	Summary	The aircraft took off from Fukushima Sky Park for flight training, and when performing a landing roll on the runway of Fukushima Sky park, it veered off the runway into a ditch where the bolts on the belts mounting the main landing gear were ruptured, causing the aircraft to be damaged from the fairing of the main wheel. A pilot and one passenger were on board the aircraft, but no one sustained injuries. The aircraft sustained substantial damage, but there was no outbreak of fire.	
9	Date and location of accident	Operator	Aircraft registration number and aircraft type

	May 23, 2015 AT AN ALTITUDE OF APPROXIMATELY 120 m AT THE TONE RIVER BED, KASHIWA CITY, CHIBA PREFECTURE	Private	MAXAIR DRIFTER XP-R503 VERT L (ULTRALIGHT PLANE), JR0552
	Summary	During the flight after taking off from the Tone River bed temporary airfield in Moriya City, Ibaraki Prefecture, the aircraft's engine stopped at an altitude of roughly 120 m, and it made a forced landing in a thicket in the nearby Tone River bed in Kashiwa City.	
10	Date and location of accident	Operator	Aircraft registration number and aircraft type
	May 30, 2015 KIRIGAMINE GLIDING FIELD, SUWA CITY, NAGANO PREFECTURE	Private	SCHEMPP-HIRTH DUO DISCUS (GLIDER), JA07KD
	Summary	After the aircraft launched from Kirigamine Gliding Field with winch towing, its tow line was cut at an altitude near 60 m, and although it attempted to return, it crashed and was destroyed. Two people sustained injuries.	
11	Date and location of accident	Operator	Aircraft registration number and aircraft type
	MAY 30, 2015 NEAR OSATSUNAI, URAUSU TOWN, KABATO DISTRICT, HOKKAIDO, JAPAN	Private	SCHEMPP-HIRTH DISCUS bT (MOTOR GLIDER), JA20TD
	Summary	After the aircraft took off from Takikawa Sky Park, there was no subsequent contact from it and so a call was made to it by radio, but there was no reply and contact could not be established. After this, a search found the aircraft in a destroyed condition in the location referred to above. One person on board suffered fatal injuries.	
12	Date and location of accident	Operator	Aircraft registration number and aircraft type
	May 30, 2015 SENDAI AIRPORT, MIYAGI PREFECTURE	JAPAN COAST GUARD	BOMBARDIER DHC-8-315 (LARGE AEROPLANE), JA727B
	Summary	When landing at Sendai Airport, the touchdown of the aircraft was slightly strong, and the external skins on both sides in the front of the fuselage were damaged.	
13	Date and location of accident	Operator	Aircraft registration number and aircraft type
	June 7, 2015 GREEN-PIA MIKI, MAKIYAMA, HOSOKAWA TOWN, TARUHO, MIKI CITY, HYOGO PREFECTURE	Private	SCHWEIZER 269C－1 (ROTORCRAFT), JA7926
	Summary	The aircraft took off from Maishima Heliport and landed at the location referred to above for passengers to get on and off. After other passengers had been boarded, the attitude of the aircraft became unstable while hovering and the aft fuselage area came into contact with the ground, causing it to roll over and be destroyed. A passenger sustained injuries.	
14	Date and location of accident	Operator	Aircraft registration number and aircraft type
	June 10, 2015 NEAR THE WESTERN END OF THE RUNWAY OF KONAN AIRPORT, OKAYAMA PREFECTURE	Private	CESSNA 525A (SMALL AEROPLANE), JA021R
	Summary	The aircraft took off from Tokyo International Airport, and when landing at Konan Airport, it overran the runway, coming to a stop in a pond near the western end of the runway.	
15	Date and location of accident	Operator	Aircraft registration number and aircraft type
	June 16, 2015 NEAR KUGEBASHI TEMPORARY AIRFIELD, KUMAGAYA CITY, SAITAMA PREFECTURE	Private	ASC TWINSTAR - R503 (ULTRALIGHT PLANE), JR7403
	Summary	Immediately after taking off from Kugebashi temporary airfield for flight training, the aircraft crashed into the Arakawa River bed and was damaged. One person sustained serious injuries.	
16	Date and location of accident	Operator	Aircraft registration number and aircraft type
	JULY 20, 2015 BETSUKAI FLIGHT PARK, BETSUKAI TOWN, NOTSUKE-GUN, HOKKAIDO	Private	CESSNA 172P (small aeroplane), JA4005

	Summary	Immediately after taking off from Betsukai Flight Park temporary airfield for a leisure flight, the aircraft crashed and was damaged. Three persons suffered serious injuries, while one person sustained minor injuries. A fire broke out after the aircraft crashed. 	
17	Date and location of accident	Operator	Aircraft registration number and aircraft type
	July 26, 2015 1-24 FUJIMI TOWN, CHOFU CITY, TOKYO	Private	PIPER PA-46-350P (SMALL AEROPLANE), JA4060
	Summary	The aircraft took off heading south from the runway of Chofu Airfield with a pilot and four passengers on board, but crashed in a residential area near the location referred to above and caught fire. The pilot, one passenger, and one resident suffered fatal injuries, and three passengers and two residents sustained injuries. The aircraft was destroyed. 	
18	Date and location of accident	Operator	Aircraft registration number and aircraft type
	AUGUST 15, 2015 IN KANGORI GOLF COURSE (TSUKUBANE COUNTRY CLUB), TSUKUBA CITY, IBARAKI PREFECTURE	Private	ISHIJIMA MCR-01 (ultralight plane), JX0145
	Summary	The aircraft took off from Chikusei City, Ibaraki Prefecture (Akeno Sky Sport Club temporary airfield) but crashed at the golf course referred to above. Two persons on board suffered fatal injuries.	
19	Date and location of accident	Operator	Aircraft registration number and aircraft type
	August 19, 2015 ON THE RUNWAY OF SAPPORO AIRFIELD, SAPPORO CITY, HOKKAIDO	Private	PIPER PA-28R-201 (SMALL AEROPLANE), JA4193
	Summary	The aircraft took off from Sapporo Airfield, and when landing on the same airfield, it made a belly landing and was damaged.	
20	Date and location of accident	Operator	Aircraft registration number and aircraft type
	August 25, 2015 BIEI GLIDING FIELD, BIEI TOWN, KAMIKAWA DISTRICT, HOKKAIDO	Private	DIAMOND AIRCRAFT HK36TTC (MOTOR GLIDER), JA21DA
	Summary	The aircraft took off from Biei Gliding Field and landed at the same field, but it veered off the runway to the right, coming to a stop in a grass field outside of the runway. At this time, the aft fuselage broke off and the propeller and other areas were damaged.	
21	Date and location of accident	Operator	Aircraft registration number and aircraft type
	August 28, 2015 AGUNI AIRPORT, OKINAWA PREFECTURE	FIRST FLYING CO., LTD.	VIKING DHC-6-400 (SMALL AEROPLANE), JA201D
	Summary	The aircraft took off from Naha Airport and landed at Aguni Airport, but veered off the runway and came to a stop past a fence outside of the runway.	
22	Date and location of accident	Operator	Aircraft registration number and aircraft type
	September 9, 2015 KITAMI DISTRICT TEMPORARY OPERATION SITE (FOR AGRICULTURAL USE), KITAMI CITY, HOKKAIDO	Private	HOFFMAN H-36 DIMONA (MOTOR GLIDER), JA2528
	Summary	The aircraft took off from the Kitami District Temporary Operation Site (for Agricultural Use) and landed at the same field, but veered off the runway to the right, coming to a stop on a slope to the side of the field.	
23	Date and location of accident	Operator	Aircraft registration number and aircraft type
	September 22, 2015 HONDA AIRPORT, OKEGAWA CITY, SAITAMA PREFECTURE	HONDA AIRWAYS CO., LTD.	CESSNA 172S (SMALL AEROPLANE), JA31HA
	Summary	When landing at Honda Airport, the touchdown of the aircraft was slightly strong and the tail of the fuselage came into contact with the runway, so it performed a go-around and then landed at the same airport.	

24	Date and location of accident	Operator	Aircraft registration number and aircraft type
	October 13, 2015 IN ASO DUDE RANCH, YAMADA, ASO CITY, KUMAMOTO PREFECTURE	Private	AIR COMMAND ELITE R582 (GYROPLANE), JE0146
	Summary	During the flight after taking off from a temporary landing field in Aso City, the aircraft crashed in a grassy area near the location referred to above.	
25	Date and location of accident	Operator	Aircraft registration number and aircraft type
	November 16, 2015 ON RUNWAY A OF SENDAI AIRPORT, MIYAGI PREFECTURE	Private	BEECHCRAFT A36 (SMALL AEROPLANE), JA3762
	Summary	The aircraft took off from Sendai Airport and when landing at the same airport, it made a belly landing and was damaged.	
26	Date and location of accident	Operator	Aircraft registration number and aircraft type
	November 22, 2015 MATSUIDA TOWN, ANNAKA CITY, GUNMA PREFECTURE	Private	ROBINSON R22BETA (ROTORCRAFT), JA7963
	Summary	The aircraft took off from Tokyo Heliport and crashed in Matsuida Town, Annaka City, Gunma Prefecture. Two persons suffered fatal injuries.	
27	Date and location of accident	Operator	Aircraft registration number and aircraft type
	December 20, 2015 TEMPORARY LANDING FIELD IN SHIZUOKA CITY, SHIZUOKA PREFECTURE (FUJIKAWA GLIDING FIELD)	Private	PIPER PA-18-150 (SMALL AEROPLANE), JA4048
	Summary	The aircraft took off from a temporary landing field in Shizuoka City (Fujikawa Gliding Field), and when landing at the same landing field, it veered off the runway, overturning and coming to a stop in a grassy area on the western side of the runway	

(Aircraft serious incidents)

1	Date and location of accident	Operator	Aircraft registration number and aircraft type
	April 5, 2015 TOKUSHIMA AIRPORT, TOKUSHIMA PREFECTURE	JAPAN AIRLINES CO., LTD.	BOEING 767-300 (LARGE AEROPLANE), JA8299
	Summary	The aircraft took off from Tokyo International Airport, and when making a landing approach at Tokushima Airport, it confirmed a work vehicle on the runway and performed a go-around. After this, it landed properly at Tokushima Airport.	
2	Date and location of accident	Operator	Aircraft registration number and aircraft type
	June 3, 2015 ON THE RUNWAY OF NAHA AIRPORT, OKINAWA PREFECTURE	JAPAN TRANSOCEAN AIR CO., LTD. (AIRCRAFT A)	BOEING 737-400 (LARGE AEROPLANE), JA8938
		ALL NIPPON AIRWAYS CO., LTD. (AIRCRAFT B)	BOEING 737-800 (LARGE AEROPLANE), JA80AN
		JAPAN AIR SELF-DEFENSE FORCE (AIRCRAFT C)	CH47 (ROTORCRAFT), 57-4493
	Summary	When Aircraft B was making a takeoff run on Runway 18 of Naha Airport, Aircraft C crossed in front of it without instructions from the air traffic controller, so Aircraft B aborted its takeoff. At this time, the air traffic controller instructed Aircraft A, which was on approach, to redo its landing, but Aircraft A landed before Aircraft B withdrew from the runway.	
3	Date and location of accident	Operator	Aircraft registration number and aircraft type
	June 30, 2015 AT AN ALTITUDE OF APPROXIMATELY 11,000 m, APPROXIMATELY 55 km EAST-NORTHEAST OF TANEGASHIMA AIRPORT, KAGOSHIMA PREFECTURE	JAPAN TRANSOCEAN AIR CO., LTD.	BOEING 737-400 (LARGE AEROPLANE), JA8525

	Summary	During the flight after taking off from Naha Airport, a malfunction occurred in the aircraft's air bleed system (system for sending air into the interior of the aircraft from the engine) near the area referred to above. Since this caused a drop in the internal air pressure of the aircraft, the aircraft declared an emergency and descended to an altitude of approximately 3,000 m. After this, the emergency was cancelled and the flight continued, landing at Kansai International Airport.	
4	Date and location of accident	Operator	Aircraft registration number and aircraft type
	July 7, 2015 AT AN ALTITUDE OF APPROXIMATELY 10,000 m, APPROXIMATELY 60 km SOUTHWEST OF AKITA AIRPORT, AKITA PREFECTURE	FUJI DREAM AIRLINES CO., LTD.	EMBRAER ERJ170-200STD (LARGE AEROPLANE), JA06FJ
	Summary	During the flight after taking off from New Chitose Airport, a malfunction occurred in the aircraft's air bleed system near the area referred to above. Since this caused a drop in the internal air pressure of the aircraft, the aircraft declared an emergency and descended to an altitude of approximately 3,000 m. It diverted to Niigata Airport and landed there.	
5	Date and location of accident	Operator	Aircraft registration number and aircraft type
	July 22, 2015 AT AN ALTITUDE OF APPROXIMATELY 90 m, IN THE AREA OF IWAKIFUKUNOMATA, YURIHONJO CITY, AKITA PREFECTURE	TOHOKU AIR SERVICE, INC.	AEROSPATIALE AS332L1 (ROTORCRAFT), JA6777
	Summary	The aircraft took off from a temporary landing field in the area of Iwakifukunomata, Yurihonjo City, with cargo (a work shed) suspended outside of the aircraft from the cargo suspension area, and during the flight toward the unloading area, part of the cargo (3 aluminum doors, approximately 180 cm x 90 cm and approximately 5 kg) dropped near the location referred to above.	
6	Date and location of accident	Operator	Aircraft registration number and aircraft type
	October 2, 2015 AT AN ALTITUDE OF APPROXIMATELY 240 m, NEAR HASHIDATE, ITOIGAWA CITY, NIIGATA PREFECTURE	AERO ASAHI CORPORATION	AEROSPATIALE AS332L1 (ROTORCRAFT), JA9678
	Summary	The aircraft took off from a temporary landing field in Itoigawa City, and during the flight toward the same landing field after transporting ready-mixed concrete to a work site in the same city, an empty bucket (approximately 1.4 m in height x 1.6 m in diameter, and approximately 210 kg in weight) dropped near the location referred to above.	
7	Date and location of accident	Operator	Aircraft registration number and aircraft type
	October 8, 2015 AT AN ALTITUDE OF APPROXIMATELY 170 m, NEAR TAKAHAMA TOWN, OI DISTRICT, FUKUI PREFECTURE	NAKANIHON AIR SERVICE CO., LTD.	AEROSPATIALE AS332L (ROTORCRAFT), JA9660
	Summary	The aircraft took off from a temporary landing field in Takahama Town, and while transporting cargo, a wooden frame (approximately 1.3 m vertically x 0.5 m horizontally, and approximately 2.6 kg in weight) dropped near the location referred to above. It was discovered near the parking area in a Kansai Electric Power Company training facility in Suimei, Takahama Town.	
8	Date and location of accident	Operator	Aircraft registration number and aircraft type
	October 10, 2015 NEAR AN AREA 3 nm (APPROXIMATELY 5.4 km) FROM THE END OF RUNWAY 34 OF KAGOSHIMA AIRPORT, KAGOSHIMA PREFECTURE, ON THE PATH OF THE FINAL APPROACH TO THE RUNWAY	JAPAN AIRLINES CO., LTD. (AIRCRAFT A)	BOEING 767-300 (LARGE AEROPLANE), JA8364
		NEW JAPAN AVIATION CO., LTD. (AIRCRAFT B)	BRITTEN-NORMAN BN-2B-20 (SMALL AEROPLANE), JA80CT
	Summary	On the path of its final approach to Runway 34 of Kagoshima Airport, Aircraft A confirmed a fixed-wing aircraft ahead of it near the area 3 nm (approximately 5.4 km) from the end of the runway, at an altitude of approximately 1,000 ft (approximately 300 m), and so it redid its landing.	
9	Date and location of accident	Operator	Aircraft registration number and aircraft type
	December 4, 2015 TEMPORARY LANDING FIELD IN KAWACHI TOWN, INASHIKI DISTRICT, IBARAKI PREFECTURE (OTONE AIRFIELD)	Private	MAULE AIR M-7-235C (SMALL AEROPLANE), JA30HT

	Summary	When the aircraft was taxiing after landing at a temporary landing field in Kawachi Town, its tail gear was damaged and it became unable to propel itself.

6 Statistics of published aircraft accident and serious incident investigation reports

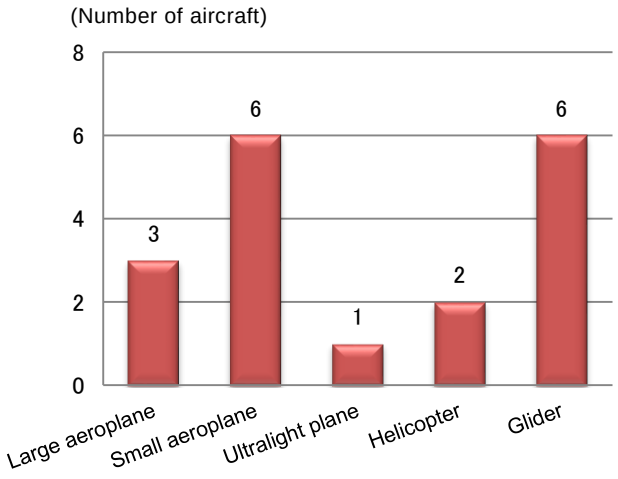
The number of investigation reports of aircraft accidents and serious incidents published in 2015 was 29, consisting of 18 aircraft accidents and 11 aircraft serious incidents.

Looking at those accidents and serious incidents by aircraft category, the accidents involved three large aeroplanes, six small aeroplanes, one ultralight plane, two helicopters and six gliders. The aircraft serious incidents involved eight large aeroplanes, one small aeroplane, and five helicopters.

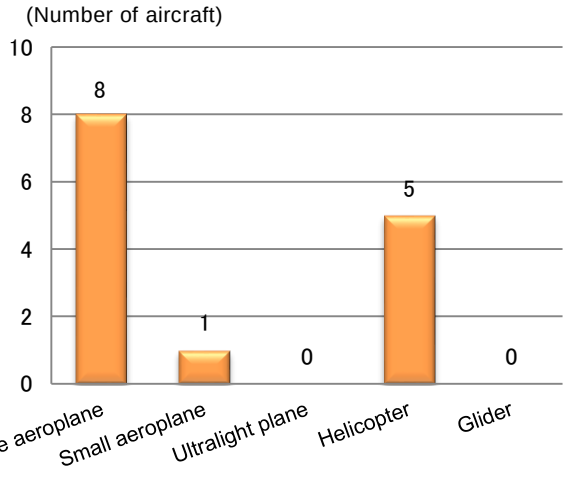
Note: In aircraft accidents and serious incidents, two or more aircraft are sometimes involved in a single case.

In the 18 accidents, the number of casualties was 24, consisting of four death, and 20 injured persons.

Number of published aircraft accident reports (18 cases) by aircraft category in 2015



Number of published aircraft serious incident reports (11 cases) by aircraft category in 2015



The investigation reports for aircraft accidents and serious incidents published in 2015 can be found on JTSB website at:

http://www.mlit.go.jp/jtsb/airrep.html

Column

Participating in Training on the Structure and Flight of Gliders

Aircraft Accident Investigator

The aircraft to which “aircraft accidents” and “aircraft serious incidents” apply also include gliders. Advanced specialized knowledge, experience, and investigation skills are needed to analyze and determine the causes of such events in their investigations, and among these, knowledge of the structures and flight characteristics of gliders are of obvious importance.

On this occasion, with the cooperation of the Japan Students Aviation League, I participated in a lecture on the structures and flight of gliders at the Menuma Gliding Field in the Tonegawa River bed in Kumagaya City, Saitama Prefecture, and here provide an introduction of its content.

First of all, I confirmed my knowledge of the different types of gliders in a classroom lecture format. Under aviation laws, these consist of motor gliders, high class gliders, middle class gliders, and primary class gliders, which are classified according to differences in their capability for acrobatic flight, and also whether they are towed by aircraft, winches, or other means.

The next topic covered was flight characteristics. Gliders fly in the same manner as airplanes, by receiving lift from the air flowing around their wings during flight. To continue flying or to gain altitude, they use the flow of rising air currents (wind blowing in an upward direction) known as thermals, ridges, waves, etc. Since these rising air currents are critical for flight but are not visible by eye, their location and strength can be estimated from terrain, weather conditions, cloud movement, and other parameters. It was also mentioned that since they can be predicted based on the temperature of the upper air, observation data from weather observation probes is used as well.

In a lecture class using actual aircraft, I was able to examine the structure of an Alexander Schleicher ASK21 glider. This aircraft is made of FRP with a monocoque structure, and is equipped with an expandable air brake at the upper surface of its main wings. Compared to an airplane, it has extremely simple instrumentation and mechanical equipment. Gliders are provided with locations to attach a tow line (release), but since the characteristics of winch-towing and airplane-towing are different, their attachment locations also differ.

Finally, I was given an opportunity to try going on board a glider. There was no noise generated by the aircraft since it has no motor of its own, with the only sounds being those of the rushing wind, and I was able to strengthen my understanding of the characteristics of glider flight, such as the importance of always having a strong understanding of the wind while flying.

Although as an aircraft accident investigator, I have undergone various types of studies and training, this glider training session was extremely valuable to me, and I believe I was able to obtain knowledge, experience, and skill that will be highly useful in accident investigations.

7 Actions taken in response to recommendations in 2015

Actions taken in response to recommendations were reported with regard to three aircraft accidents and one aircraft serious incident in 2015. Summaries of these reports are as follows.

① Aircraft accident involving a FEDERAL EXPRESS CORPORATION MCDONNELL DOUGLAS MD-11F, N526FE

(Safety Recommendation on April 26, 2013)

As a result of the investigation of an aircraft accident which occurred on the runway of Narita International Airport on March 23, 2009, the JTSB published an investigation report and made safety recommendations to the Federal Aviation Administration (FAA), on April 26, 2013. The Board received the following responding report on the actions taken in response to the safety recommendations.

○ Summary of the Accident

On March 23 (Monday), 2009, about 06:49 local time*1, a McDonnell Douglas MD-11F, registered N526FE, operated by Federal Express Corporation as the scheduled cargo flight FDX80, bounced repeatedly during landing on Runway 34L at Narita International Airport. During the course of bouncing, its left wing was broken and separated from the fuselage attaching point and the airplane caught fire. The airplane rolled over to the left being engulfed in flames, swerved off the runway to the left and came to rest inverted in a grass area.

The Pilot in Command (PIC) and the First Officer (FO) were on board the airplane, and both of them suffered fatal injuries.

The airplane was destroyed and the post-crash fire consumed most parts.

○ Probable Causes

In this accident, when the airplane landed on Runway 34L at Narita International Airport, it fell into porpoising. It is highly probable that the left wing fractured as the load transferred from the left MLG to the left wing structure on the third touchdown surpassed the design limit (ultimate load).

It is highly probable that a fire broke out as the fuel spillage from the left wing caught fire, and the airplane swerved left off the runway rolling to the left and came to rest inverted on the grass area.The direct causes which the airplane fell into the porpoise phenomenon are as follows:

a. Large nose-down elevator input at the first touchdown resulted in a rapid nose–down motion during the first bounce, followed by the second touchdown on the NLG with negative pitch attitude. Then the pitch angle rapidly increased by the ground reaction force, causing the larger second bounce, and

b. The PF‘s large elevator input in an attempt to control the airplane without thrust during the second bounce.

In addition, the indirect causes are as follows:

a. Fluctuating airspeed, pitch attitude due to gusty wind resulted in an approach with a large sink rate,

b. Late flare with large nose-up elevator input resulted in the first bounce and

c. Large pitch attitude change during the bounce possibly made it difficult for the crewmembers to judge airplane pitch attitude and airplane height relative to the ground (MLG height above the runway).

d. The PM's advice, override and takeover were not conducted adequately.

It is somewhat likely that, if the fuse pin in the MLG support structure had failed and the MLG had been separated in the overload condition in which the vertical load is the primary component, the damage to the fuel tanks would have been reduced to prevent the fire from developing rapidly.

It is probable that the fuse pin did not fail because the failure mode was not assumed under an overload condition in which the vertical load is the primary component due to the interpretation of the requirement at the time of type certification for the MD-11 series airplanes.

○ Safety Recommendations to the Federal Aviation Administration (FAA)

1. Actions to Be Taken by the Federal Aviation Administration

a. Although the MD-11 airplane was certified to the requirement 14 CFR 25.721(a) under the interpretation at the time of certification, its design would not meet the present interpretation of the requirement since the design allows the possibilities of causing severe damage to the airplane structure in the failure mode under an overload condition where the vertical load is the primary component, resulting in the fire due to fuel spillage. As this kind of design should not be certified from now on, the airworthiness regulation rather than the guidance material should be revised to mandate the assumption of the overload condition in which the vertical load is the primary component.

b. Heat and smoke from the fire reached the cockpit at an early stage after the accident, making it difficult to initiate quick rescue activities from outside. In order to increase the crew survivability, studies about ways to separate the flight crew compartment from heat, smoke and toxic gas should be made, and if there are any effective solutions, the FAA should consider their application to in-service airplanes.

2. Measures to Be Taken to Supervise the Boeing Company as the airplane Manufacturer

The JTSB recommends that the Federal Aviation Administration require the Boeing Company to study the possibility of design change for the MLG support structure and matters mentioned below in order to prevent the recurrence of similar accidents and minimize damage to be caused by such accidents.

a. In order to reduce the occurrence of MD-11 series airplanes' severe hard landing and bounce in which an overload is transferred to the MLGs and their supporting structure, the Boeing Company should improve the controllability and maneuver characteristics by improving the LSAS functions, reducing the AGS deployment delay time and other possible means.

Possible improvement on LSAS functions may include: a function to limit large nose-down elevator input during touchdown phase, which is a common phenomenon in severe hard landing cases accompanied by structural destruction for MD-11; and a function to assist bounce recovery and go-around in case of bounce.

b. In order to help pilots to conduct recovery operation from large bounces and judge the necessity of go-around, studies should be made to install a visual display and an aural warning system which show gear touchdown status on MD-11 series airplanes.

○ Actions Taken in Response to the Safety Recommendations

Actions to be Taken by the Federal Aviation Administration

1) The main landing gear must be designed to prepare against failure due to dominant loads, and as these dominant loads must consider the combination of upward loads and rearward loads together with loads in the horizontal direction, FAR25.721(a) was revised and made effective from December 1, 2014.

2) In addition, advisory circular (AC) 25-30 was published on October 7, 2014, in which it was noted: "Failure of the main landing gear must consider dominant loads due to an appropriate combination in the vertical direction and the direction of pull."

Measures to be Taken to Instruct the Boeing Company as a Designer and Manufacturer of the Aircraft

The FAA approved Boeing's Strut Extended Annunciation System (SEAS) on December 17, 2014.

* SEAS: A system that uses only blue lamp displayed in the cockpit to inform flight crew members if both main landing gear cushioning devices are detected by sensors to be within 0.5 inches of their fully-extended state after the aircraft touches down (indicating that the aircraft has left the ground).

* The report (original) from the Federal Aviation Administration is published on the JTSB website:
http://www.mlit.go.jp/jtsb/airkankoku/anzenkankoku6re_150715.pdf
http://www.mlit.go.jp/jtsb/airkankoku/anzenkankoku6re_160126.pdf

② Aircraft accident involving a SHIKOKU AIR SERVICE CO., LTD EUROCOPTER AS350B3 (ROTORCRAFT), JA6522

(Safety Recommendation on June 28, 2013)

As a result of the investigation of an aircraft accident which occurred in Hiketa, Higashikagawa City, Kagawa Prefecture, on September 22, 2011, the JTSB published an investigation report and made safety recommendations to the European Aviation Safety Agency (EASA), on June 28, 2013. The Board received the following responding report on the actions taken in response to the safety recommendations.

○ Summary of the Accident

On Thursday, September 22, 2011, a Eurocopter AS350B3, registered JA6522, operated by Shikoku Air Service Co., Ltd., took off from Takamatsu Airport at around 09:23 for power transmission lines inspection flight. A burnt smell and white smoke rose in the cabin during this flight, and at around 10:10, the helicopter made a forced landing at a baseball field located at Hiketa, Higashikagawa City, Kagawa Prefecture.


By courtesy of Passenger A

On board the helicopter were a pilot and two passengers, but none of them suffered injury. After the forced landing, the helicopter caught fire and was destroyed.

○ Probable Causes

In this accident, it is highly probable that a fire occurred in the rear hold of the Helicopter and the Helicopter made a forced landing.

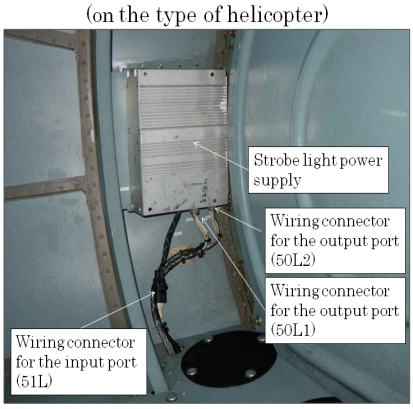
Regarding a fire in the rear hold, it could not be identified the ignition source; nevertheless it is possible that a fire occurred from the wiring connected to the strobe light power supply, which was installed in the rear hold, and that it spread to inflammables placed around the power supply.

This is because the wiring was not designed and structured so that it was fully protected so as to prevent it from being damaged due to the movement of embarkation and preclude a risk of occurring a fire even if

it was damaged or destroyed.

It is also possible that since it was not covered with nets to prevent its movement, embarkation in the rear hold damaged the wiring, which was not fully protected from damage due to the movement of the embarkation.

Installation of the strobe light power supply (on the type of helicopter)



Installation of the strobe light power supply (on the type of helicopter)

○ Safety Recommendations

(1) Electrical equipment and its wiring in the baggage compartment

The EASA should make it mandatory to modify the rear hold of the Eurocopter AS 350 series so that electrical equipment and its wiring are fully protected.

(2) Manifestation of the matters which must be dealt with immediately by memory among the emergency procedures

In the Flight Manual of the Eurocopter AS350 Series, the EASA should urge the designer and manufacturer of the helicopter to specify the memory items among emergency procedures so that they can be performed immediately.

○ Actions Taken in Response to the Safety Recommendations

(1) On November 27, 2013, EASA issued the Airworthiness Directive 2013-0281 which supersedes the Airworthiness Directive 2011-0244-E and requires the installation of the protector assembly on the wiring and on the power supply unit of the position strobe light installation, thus providing a terminating action of the repetitive inspections and allowing any deactivated systems to be activated again.

(Report on February 19, 2014)

(2) Re-investigation of the aviation service record and "Case Occurrence Database" indicated no previous cases where there were safety concerns related to omission of memory items. Therefore, it was determined that there was no need to revise the flight regulations.

(Report on March 6, 2015)

*The report (original) from the European Aviation Safety Agency is published on the JTSB website: http://www.mlit.go.jp/jtsb/airkankoku/anzenkankoku7re_150330.pdf

③ Aircraft accident involving a OBIHIRO BRANCH SCHOOL OF THE CIVIL AVIATION COLLEGE, BEECHCRAFT A36, JA4215

(Safety Recommendation on December 20, 2013)

As a result of the investigation of an aircraft accident which occurred on the slope of Mt. Tsurugi in Memuro-cho, Kasai District, Hokkaido, on July 28, 2011, the JTSB published an investigation report and made recommendations to the Minister of Land, Infrastructure, Transport and Tourism on December 20, 2013. The Board received the following notice on the measures in response to the recommendations.

○ Summary of the Accident

On Thursday, July 28, 2011, a Beechcraft A36, registered JA4215, operated by the Obihiro Branch School of the Independent Administrative Institution Civil Aviation College, took off from Obihiro Airport for flight training at 09:11 Japan Standard Time. At around 09:22, when practicing basic instrument flight in the training and testing area, the airplane crashed into the slope of Mt. Tsurugi in Memuro-cho, Kasai District, Hokkaido.

On board the airplane were four persons: an instructor who was captain, two students, and an instructor in educational and research flight. Three of them: the captain, one of the students, and other instructor suffered fatal injuries, and the remaining student sustained serious injury.

The airplane was destroyed and a post-crash fire broke out.

○ Probable Causes

It is highly probable that the accident occurred as follows: The airplane conducting VFR BIF training operated by a hooded student was instructed by his instructor to fly into the mountainous area; It then flew into clouds or close to the clouds that covered the mountains, losing sight of ground references and approached the ground very close against the instructor's expectation; The instructor took the controls from the student and attempted to evade the mountains, but the airplane failed to change its course to an appropriate direction and crashed into the slope of the mountain.

It is somewhat likely that the instructor flew close to or into the clouds which covered the mountain with some intention; however, his death denied us the clarification his intention.

It is somewhat likely that the basic safety policy of the College was not instilled into the field instructors, and that there was a gap in safety awareness between management and field instructors. It is also somewhat likely that behind the accident was a problem that involved the entire organization of the College—a work environment/organizational culture that consequently allowed unsafe behaviors.

○ Recommendations for the Minister of Land, Infrastructure, Transport and Tourism

The Minister should grasp reliably the actual condition of efforts towards improvement of the safety management system of the College, check the implementation status whether such various safety measures set by the College based on the medium-term plans, etc. are carried out continuously and certainly by such as periodically audits in the field and provide more guidance depending on the results until the College becomes able to operate a safety management system autonomously and steadily. Moreover, in setting safety-related medium-term goals as prescribed in the Act on General Rules for Independent Administrative Agencies, the Minister should consider how the College's medium-term goals should be, such as setting specific goals to ensure that a safety culture is brewed and safety activity is implement surely and continuously, including reviewing in timely manner, based on the organizational climate cannot be built in a day but also it is brewed by daily ongoing activity.

○ Measures Taken by the Minister of Land, Infrastructure, Transport and Tourism in Response to the Recommendations

1. Instructions for regular on-site inspections

In order to confirm the status of initiatives for improvements to the safety management system implemented by the Independent Administrative Institution Civil Aviation College (hereinafter referred to as the "Civil Aviation College"), as well as various safety measures, it was decided for regular on-site inspections to be performed at the Civil Aviation College for the time being, and in the year 2014, a total of 4 inspections were carried out on a quarterly basis.

In the inspections performed up to this point, it was found that the construction of a safety management system and measures for its appropriate operation were being steadily implemented, and it was confirmed that the PDCA cycle was functioning with regard to safety management.

From here on as well, inspections and instructions will continue to be carried out toward the Civil Aviation College so that measures to strengthen its safety management system can be firmly established.

2. Review of medium-term goals

After receiving the applicable recommendations, the medium-term goals of the Civil Aviation College were reviewed on March 25, 2014, to strengthen its safety management system.

In the reviewed medium-term goals, a new goal of zero aircraft accidents and serious incidents was set. In order to achieve this, targets were introduced that include setting safety indicators and safety goal values in compliance with the aircraft safety program every fiscal year, enhancing the system for gathering information related to safety, and gaining a more accurate understanding of the actual educational situation in training that uses actual aircraft.

*This notice is published on the JTSB website:
http://www.mlit.go.jp/jtsb/airkankoku/kankoku4-1re_150311.pdf

④ Aircraft serious incident involving a AIR NIPPON CO., LTD. BOEING 737-700, JA16AN

(Recommended and Safety Recommendation on September 25, 2014)

As a result of the investigation of an aircraft serious incident which occurred at an altitude of approximately 41,000 ft, approximately 69 nm east of Kushimoto on September 6, 2011, the JTSB published an investigation report and made recommendations to All Nippon Airways Co., Ltd. as a party relevant to the cause of the serious incident, and safety recommendations to the Federal Aviation Administration (FAA), on September 25, 2014. The Board received the following notice on the actions to be taken in response to the recommendations (implementation plans) and the actions taken in response to the safety recommendations.

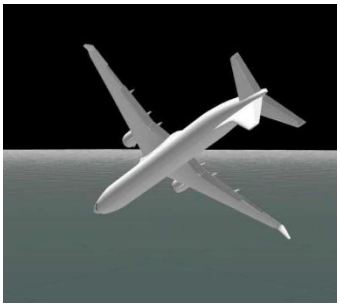
○ Summary of the Serious Incident

On September 6 (Tuesday) 2011, a Boeing 737-700, registered JA16AN, operated by Air

Nippon Co., Ltd., nosedived after having an unusual attitude (upset) at around 22:49 Japan Standard Time (JST: UTC+9hr, unless otherwise stated all times are indicated in JST) at an altitude of 41,000 ft about 69 nm east of Kushimoto while flying from Naha Airport to Tokyo International Airport as the scheduled flight 140 of the All Nippon Airways Co., Ltd.

There were 117 people on board the aircraft, consisting of the captain, the first officer, three cabin attendants and 112 passengers. Of these people, two cabin attendants sustained slight injuries.
There was no damage to the aircraft.

○ Probable Causes



It is highly probable that this serious incident occurred in the following circumstances: During the flight, the first officer erroneously operated the rudder trim control while having an intention of operating the switch for the door lock control in order to let the captain reenter the cockpit. The aircraft attitude became unusual beyond a threshold for maintaining the aircraft attitude under the autopilot control. The first officer's recognition of the unusual situation was delayed and his subsequent recovery operations were partially inappropriate or insufficient; therefore, the aircraft attitude became even more unusual, causing the aircraft to lose its lifting force and went into nosedive. This led to a situation which is equivalent to "a case where aircraft operation is impeded."

It is probable that the followings contributed to the first officer's erroneous operation of the rudder trim control while having an intention of operating the door lock control; he had not been fully corrected his memories of operation about the door lock control of the Boeing 737-500 on which he was previously on duty; the door lock control of the Boeing 737-500 series aircraft was similar to the rudder trim control of the Boeing 737-700 series aircraft in their placement, shape, size and operability. It is somewhat likely that his memories of operation about the switch for the door lock control of the Boeing 737-500 aircraft had not been fully corrected because he failed to be fully accustomed with the change in the location of the switch for the door lock control. It is somewhat likely that this resulted from lack of effectiveness in the current system for determining the differences training contents and its check method, under which the Air Nippon Co., Ltd. and other airlines considered and adopted specific training programs to train pilots about how to operate the flight deck switches when their locations changed and the Civil Aviation Bureau of the Ministry of Land, Infrastructure, Transport and Tourism reviewed and approved them. It is probable that the first officer's failure to properly manage tasks contributed to his erroneous operation of the rudder trim control.

It is somewhat likely that the similarities between the switches for the door lock control and the rudder trim control in their operability contributed to the delay in his recognition of the erroneous operation. Moreover, he was excessively dependent on autopilot flight and he failed to be fully aware of monitoring the flight condition.

It is somewhat likely that the first officer's recovery operations were partially inappropriate or insufficient because he was startled and confused on the occurrence of an unexpected unusual situation in which the stick shaker was activated during the upset recovery maneuver. It is somewhat likely that the followings contributed to his startle and confusion: he had not received upset recovery training accompanied with a stall warning and in unexpected situations, thereby he lacked the experience of performing duties in such situations before the serious incident, and he had not received upset recovery training at a high altitude.

○ Recommendations to All Nippon Airways

(1) Thorough implementation of basic compliance matters for cases when the aircraft is operated by a single pilot and training to this end

The preventive measures concerned, as described in the OM information published by Air Nippon Co., Ltd. and in The Flight ANA Group, should be thoroughly implemented for all flight crew members as specific and permanent basic compliance matters and they should be continuously trained to this end.

(2) Implementation of high altitude upset recovery training accompanied with stall warning and other

events.

Airlines should implement "upset recovery training" at a high altitude upon considering defined flight envelope validated region of flight simulators. If necessary, they should also introduce a system to examine whether the recovery process is made outside the validated region. Moreover, scenarios in which a stall warning and others will be simultaneously activated or in which an upset cannot be expected by trainees should be prepared for such training.

○ Safety Recommendations to Federal Aviation Administration (FAA)

The aircraft designer and manufacturer shall study the need to reduce or eliminate the similarities between the rudder trim control and the switch for the door lock control of the Boeing 737 series aircraft, in terms of the shape, size and operability as mentioned in this report. In particular, it shall consider the effectiveness of changing the shape and size of the rudder trim control to the design adopted for the rudder trim control for Boeing models other than those of the Boeing 737 series, in which the switch has a cylindrical shape about 50mm in diameter without a brim, so that the difference of the size and shape can be recognized only with a touch.

○ Actions to be Taken by All Nippon Airways Co., Ltd. in Response to the Recommendations (Implementation Plans)

(1) Thorough implementation of basic compliance matters for cases when aircraft is operated by a single pilot and training to this end

When All Nippon Airways Co., Ltd. (hereinafter referred to as "our company") succeeded the transportation operations of Air Nippon Co., Ltd., we reflected content equivalent to the OM Information issued by Air Nippon Co., Ltd. after the occurrence of this incident as a measure to prevent its recurrence in our Policy Manual, issued "The Flight ANA Group" to all flight crew members of our company's group once again, and made plans to thoroughly implement basic compliance matters, but the following items shall also be implemented as additional actions.

Action already taken

1) By reflecting the basic compliance matters for cases when an aircraft is operated by a single pilot (content to be discussed and agreed on before leaving one's seat, prioritization of items while away from one's seat, visual confirmation of switches when entering the cockpit, etc.) once again in the OM Supplement, the system was made to enable thorough implementation of more specific and permanent compliance with those matters.

Action to be taken from here on

2) Education consisting of regular training (academic subjects) shall be held once every 3 years starting from fiscal year 2015 on the basic compliance matters for cases when an aircraft is operated by a single pilot, and a QMS Bulletin on this was issued.
(January 15, 2015)

[Training completion report scheduled for April 2016]

(2) Implementation of high altitude upset recovery training accompanied with stall warning and other events.

1) Previously, upset recovery training using a flight simulator was implemented based on IOSA (IATA Operational Safety Audit) Standards, etc. in training when obtaining aircraft type restrictions and in regular training (once every 3 years). However, based on various information obtained from relevant organizations, aircraft manufacturers, and other parties in studies on international trends carried out in

association with this serious incident, efforts are being made to implement the training measures described below.

Action already taken

(a) Prepare training materials to provide education on the causes of upsets and the methods of upset recovery, with reference to training materials issued by aviation-related groups. Completed by all flight crew members. (March 1, 2013 – April 30, 2014)

Action already taken

(b) Since delays in recognizing conditions can further the occurrence of incidents, special measures were taken when carrying out recovery training using simulators, such as having participants close their eyes to delay the recognition of surrounding conditions, and such training has also been implemented for high-altitude situations where there is little margin for recovering from stalls. (March 1, 2013 – April 30, 2014)

Action already taken

(c) Items (a) and (b) above were implemented in the fiscal year 2013 regular training, ahead of their standard implementation once every 3 years. (March 1, 2013 – April 30, 2014)

Action already taken

(d) Instruction guides for flight instructors have been prepared, additional knowledge on methods of upset recovery has been provided, the defined flight envelope validated region of flight simulators has been made known, and the knowledge and education level of flight instructors have been improved and standardized (implemented in September 2014 instructor meeting).

Action to be taken from here on

(e) Since many of the fatal accidents caused by upsets are accompanied by the occurrence of stalls, educational materials providing additional knowledge on stalls and giving instructions on the methods of stall recovery will be prepared.
Scheduled for completion by all flight crew members in fiscal year 2015 regular training.
(Preparation of educational materials completed in February 2015, completion by all members is scheduled for the period of March 2015 - April 2016. Comprehensive evaluation is scheduled in UPRT training using FFS after fiscal year 2016.)

[Completion report scheduled for April 2016]

A “Completion Report on Measures to be Taken” shall be submitted regarding items (1) 2) and (2) 1) (e) described above, with an approximate target of April 2016.

Items to continue to be investigated in the future

In the future, studies on international trends shall be continued, and continuous investigations shall be conducted on improvements regarding: the introduction of aerodynamic models faithfully simulating aircraft behavior after stalls by actively working with manufacturers and other relevant organizations, the introduction of systems to judge whether recovery processes are made outside of the defined flight envelope validated regions of simulators, the development of scenarios for training in which a stall warning and others will be simultaneously activated or in which an upset cannot be expected by trainees, and the provision of additional knowledge involving aerodynamic characteristics at high altitudes and control for upset recovery.

End

*The implementation plan is published on the JTSB website.
http://www.mlit.go.jp/jtsb/airkankoku/kankoku5-2re_150311.pdf

○ Actions Taken in Response to the Safety Recommendations

Regarding improvements to the shape of door opening switches on flight decks, the following conclusions were obtained as a result of analysis conducted jointly with Boeing Corporation in order to prevent erroneous operation.

1) From the perspective of the "human factor", the arrangement of switches is more important than the shape of switches.
2) It was confirmed that there are cases where the arrangement of switches is not uniform among aircraft types even from the same airline, so it would be preferable for differences in their arrangement to be minimized.
3) Companies operating in the USA use a procedure where if a flight crew member leaves the cockpit during operation, another crew member is instructed to enter, and when the flight crew member enters the cockpit again, the door lock is released manually, with the door opening switch on the flight deck not being used. Therefore, it was concluded that this problem would not have any impacts.

The information in these analysis results was submitted from the FAA to airlines in the USA and to overseas aviation authorities.

*The report (original) from the Federal Aviation Administration is published on the JTSB website: http://www.mlit.go.jp/jtsb/airkankoku/anzenkankoku9re_150623.pdf

⑤ Aircraft serious incident involving a ALL NIPPON AIRWAYS CO., LTD. BOEING 787-8, JA804A

(Safety Recommendation on September 25, 2014)

As a result of the investigation of a serious aircraft incident which occurred at Takamatsu Airport on January 16, 2013, the JTSB published an investigation report and made safety recommendations to the Federal Aviation Administration (FAA), on September 25, 2014. The Board received the following report on the actions taken in response to the safety recommendations.

○ Summary of the Serious Incident

On January 16 (Wednesday), 2013, a Boeing 787-8, operated by All Nippon Airways Co., LTD., registered JA804A, took off from Yamaguchi Ube Airport for Tokyo international Airport at 08:11 local time as its scheduled flight 692. When it was climbing through 32,000 ft over Shikoku Island, an EICAS message of battery failure came on at 08:27 accompanied by unusual smell in the cockpit. The airplane diverted to Takamatsu Airport and landed there at 08:47. An emergency evacuation was executed using slides on T4 taxiway at 08:49.

Four passengers out of 137 occupants (the Captain, seven crewmembers and 129 passengers) suffered minor injuries during the evacuation.

Although the main battery was damaged, it did not lead to a fire.

○ Probable Causes

The emergency evacuation was executed on Takamatsu Airport taxiway in the serious incident, which was a consequence of emergency landing deriving from the main battery thermal runaway during the airplane's takeoff climb.

Interior of main battery

Internal heat generation in cell 6 very likely developed into venting, making it the initiating cell, resulting in cell-to-cell propagation and subsequent failure of the main battery. It is very likely that cell 6 internal heat generation and increased internal pressure caused it to swell, melt the surrounding insulation material and contact the brace bar creating a grounding path that allowed high currents to flow through the battery box. The currents generated arcing internal to the battery that contributed to cell-to-cell propagation consequently destroying the battery.

Cell 6 heat generation was probably caused by internal short circuit; however, the conclusive mechanism thereof was not identified.

In the serious incident, the internal short circuit of a cell developed into cell heat generation, thermal propagation to other cells, and consequently damaged the whole battery. The possible contributing factors to the thermal propagation are that the test conducted during the developmental phase did not appropriately simulate the on-board configuration, and the effects of internal short circuit were underestimated.

○ Safety Recommendations to Federal Aviation Administration (FAA)

1. Actions to be taken by the Federal Aviation Administration
   a. Provide instruction to airplane manufactures and equipment manufactures to perform equipment tests simulating actual flight operations.
   b. Review the technical standards for lithium ion battery to ensure that the electric environment is appropriately simulated, and if necessary, amend the standards.
   c. Review the lithium ion battery failure rate estimated during the 787 type certification, and if necessary, based on its result, review the lithium ion battery safety assessment.
   d. Review the type certificate for its appropriateness on heat propagation risk.
   e. Assess the impact of contactor opening after the cell vent on the flight operation and take appropriate actions, if necessary.
2. Measures to Be Taken to Instruct The Boeing Company as a Designer and Manufacturer of the 787
   a. Continue the study of internal short circuit mechanism considering the effects of non-uniform winding formation and other factors deriving from manufacturing process; and continue efforts to improve lithium ion battery quality and its reliability, reviewing the LIB operational conditions, such as temperature.
   b. Improve BCU and contactor operations which are outside the design envelop.

○ Actions Taken in Response to the Safety Recommendations

Actions to be Taken by the Federal Aviation Administration

(1), (2) New LIB standards shall be formulated, and tests shall be conducted on aircraft equipment simulating actual operation.

(3), (4), (5) Battery systems have been redesigned and approved based on new LIB safety evaluations, and measures have been specifically taken to address the risks of thermal propagation.

Measures to be Taken by Boeing Corporation as a Designer and Manufacturer of the Aircraft

(1), (2) In processes to continually review the design of battery cells, Boeing Corporation is continuing

to study internal short circuit mechanisms and investigate the LIB production processes. This includes improvements to the BCU and contactor operation.

* The report (original) from the Federal Aviation Administration is published on the JTSB website: http://www.mlit.go.jp/jtsb/airkankoku/anzenkankoku10re_150623.pdf

⑥ Aircraft serious incident involving a HOKKAIDO AIR SYSTEM CO., LTD. SAAB 340B, JA03HC
(Recommended on November 27, 2014)

As a result of the investigation of a serious aircraft incident which occurred over Okushiri Airport, Hokkaido, on June 4, 2011, the JTSB published an investigation report and made recommendations to Hokkaido Air System Co., Ltd. as a party relevant to the cause of the serious incident, on November 27, 2014. The Board received the following report (completion report) on the actions taken in response to the recommendations.

○ Summary of the Serious Incident

On June 4 (Saturday), 2011, a SAAB 340B, registered JA03HC, operated by Hokkaido Air System Co., Ltd., took off from Hakodate Airport as a scheduled Flight 2891. During the approach to Runway 31 of Okushiri Airport, the aircraft executed a go-around and once started climbing, but it soon reversed to descend. Consequently, at around 11:38 Japan Standard Time, its flight crew became aware of the situation and executed an emergency operation to avoid crash to the ground.

The aircraft flew back to Hakodate Airport, following some holdings over Okushiri Airport.

There were a total of 13 persons on board: the Pilot-in-Command, the First Officer and a cabin attendant as well as 10 passengers, but no one was injured. In addition, there was no damage to the aircraft.

○ Probable Causes

In this serious incident, during the approach to Runway 31 of Okushiri Airport, the Aircraft executed a go-around and once started climbing but it soon reverted to descend and came close to the ground. Consequently, flight crewmembers came to realize the situation and executed an emergency operation to avoid crash to the ground.

It is highly probable that the Aircraft's descent and approach to the ground was caused by the following factors:

(1) The PIC followed the Flight Director command bar instructions, which indicated the descent because the altitude setting was not changed to the initial go around altitude, and subsequently the PIC made the Aircraft descend even lower than the FD command bar instructions.

(2) The PIC and the FO could not notice descending of the Aircraft and their recovery maneuvers got delayed.

It is highly probable that these findings resulted from the fact that the PIC could not perform a fundamental instrument flight, the PIC and the FO used the Autopilot/Flight Director System in an inappropriate manner without confirming the flight instruments and the flight modes, and the FO could not transiently carry out closer monitor of the flight instruments because of the other operations to be done.

Moreover, it is probable that the FO's operation of engaging an autopilot and changing the vertical mode to make the Aircraft climb by using the Autopilot/Flight Director System eventually became a factor to delay avoiding maneuvers against ground proximity.

It is probable that the Company didn't create a standard procedure, reflecting the contents of Aircraft

Operating Manual, for its crewmembers to confirm and call out the changes mode, without noticing its importance and didn't carry out adequate training. Furthermore, it is probable that the PIC and the FO excessively relied on the autoflight system.

○ Recommendations to Hokkaido Air System Co., Ltd.

(1) Calling out and confirming the mode change for sure

Hokkaido Air System Co., Ltd. should make its flight crewmembers comply with the specifics of Airplane Operating Manual (confirmation and callouts of mode changes upon using the Autopilot/Flight Director system or on progress of automatic mode changes), as described in 2.13.4 without fail, and it should consider that Flight Training Guide shall be revised in some related matters.

(2) Appropriate use of autoflight system and management of pilots' skill

It is important for the Hokkaido Air System Co., Ltd. to increase the opportunities for training as well as utilizing simulator's session to improve raw data instrument skills. The Hokkaido Air System Co., Ltd. also should clarify the problems caused by excessive reliance on the autoflight system and consider to fully inform its flight crewmembers of specific countermeasures against them.

○ Actions Taken by Hokkaido Air System Co., Ltd. in Response to the Recommendations (Completion Report)

(1) Calling out and confirming the mode change for sure

In the basic procedures of the past AOM, when mode changes were made during use of AP/FD systems, both the PF and PM confirmed the EADI mode and the operator PF called out the mode, with instructions for this given in training when acquiring type restrictions. However, during the execution of a go-around, there is a high concentration of tasks to be performed and it was recognized that it is extremely difficult to call out go-around modes, which change in short periods of time. Therefore, the FTG was made to indicate that "Callouts shall generally be performed by the person in control of the MSP."

The following actions were taken in view of the occurrence of this serious incident.

In accordance with the intention of the AOM, in order for confirmation and callouts to be reliably implemented when modes are changed or change automatically during use of AP/FD systems, including during go-arounds, an FTG which had been standardized to a version reflecting the AOM and revised to eliminate any discrepancies was used in the skill improvement meeting (*1) held in November 2014 for all flight crew members, and its content was thoroughly communicated.

Also, its thorough establishment shall be confirmed by continued regular training using monitor flights (*2) and simulators.

(Implemented from December 1, 2014)

(*1) Skill improvement meetings

Held generally once a month in accordance with the following objectives, with the intention of improving the skill of crew members.

- Provide and study information on various issues (operating guidelines) for line operation.
- Provide and study information valuable to improving operation-related knowledge and ability.
- Provide and study various types of other information for personal growth.

(*2) Monitor flights

Flights for confirmation by an instructor on whether everyday line operation is being conducted in accordance with the operating guidelines and principles.

(2) Appropriate use of autoflight system and management of pilots' skill

As a result of investigation on increasing opportunities for training to improve raw data instrument skills, it was determined that training items for instrument weather conditions are necessary, and so topics for approaches and go-arounds using raw data instrument skills were added to the topics for regular training using simulators.
(Addition of topics: February 1, 2015; start of regular training with added topics: February 16, 2015)

Also, regarding problems caused by excessive reliance on the autoflight system, analysis revealed that these consist of direct problems related to operation, and indirect problems involving regulations, etc., and so the following response measures were taken with consideration for identifying and analyzing each respective problem.

(2)-1 Direct problems related to operation, and their response measures

As a result of closely examining the content reported in the "Aircraft Serious Incident Investigation Report (AI2014-5)" (dated November 27, 2014), the following situations are considered to be examples of problems caused by excessive reliance on the autoflight system, with the potential for a pilot to shift to unintended flight operation without realizing it, ultimately leading to a malfunction.

- Significant lack of basic confirmation or monitoring when using the autoflight system.
- Attention is focused on following the FD command bar, and callouts of mode changes are not performed, causing both the PF and PM to fail to recognize situations.
- An operator does not confirm that the horizontal and vertical modes are both set properly despite operation to change HDG/IAS modes, causing flight to become such that it is against the intention of the PF/PM.
- Following the instructions of the FD command bar even while having a sense of incongruity, without confirming information other than the EADI or basic instruments such as the velocimeter, altimeter, and vertical speed indicator.
- Even though it is recognized that the aircraft is in an abnormal condition, the inappropriate use of automatic systems is continued, or recovery is attempted by turning the automatic system on.

As a result of investigations into methods for responding to the problems identified above in instructor meetings, from the two viewpoints of "important points when using the autoflight system" and "the importance of monitoring", it was determined that it is not possible to address all of the identified problem points with education based on the FTG in its current form, and so the following actions were taken.

Items related to the autoflight system, such as important points particular to SAAB aircraft autoflight systems (Autopilot Switch Position, Mode Annunciation display) and flight phases for which monitoring is easily neglected, were added to the FTG. This was distributed to all flight crew members, and plans were made to instill all flight crew members with a thorough understanding of the content based on the applicable materials in skill improvement meetings held in March 2015, with their implementation to be continued in the future.

(2)-2 Indirect problems involving regulations, etc., and their response measures

In the AOM chapter on Normal Operation, there was only a description stating "The Autopilot shall be actively utilized." with no explanation of specific methods for its utilization. This leads to excessive adherence to the idea of "actively utilizing" the system, and as a result, it is probable that erroneous use has the potential to cause malfunctions. No special instructions were provided regarding this point either, and so the following actions were taken.

With consideration for the operating environment of our company, where non-precision approaches and visual approaches are common, it is believed to be necessary for flight crew members to have a full understanding of systems when utilizing autopilot functions, and to sufficiently recognize the importance of monitoring such as during mode changes, and so instruction based on these points is being implemented. Specifically, the important points, etc. involving use of the Auto Flight System were reflected in the FTG on March 20, 2015, and instruction regarding that content began in monitor flights from March 25, 2015.

* The completion report is published on the JTSB website:
http://www.mlit.go.jp/jtsb/airkankoku/kankoku7re_150408.pdf

⑦ Aircraft serious incident involving a J-AIR CORPORATION BOMBARDIER CL-600-2B19, JA206J

(Recommended on February 26, 2015)

See "Chapter 1: Summary of Recommendations and Opinions Issued in 2015 – 1: Recommendations" (page 2)

8 Provision of factual information in 2015

The JTSB provided factual information on one case (one aircraft accident) to relevant administrative organs in 2015. The contents are as follows.

① PRIVATELY OWNED CESSNA 172RG, JA3857

(Disseminated on May 1, 2015)

The JTSB provided factual information regarding the aircraft accident which occurred on April 26, 2015, as follows to the Japan Civil Aviation Bureau, the Ministry of Land, Infrastructure, Transport and Tourism.

(Summary of the Accident)
A privately owned Cessna 172RG, registered JA3857, took off from Iwami airport for an familiarization flight, and made a belly-landing when landing on Kagoshima Airport on Sunday, April 26, 2015. The

Aircraft sustained damage.

(Provision of factual information)

The following items were discovered regarding gear warnings as a result of the investigation.

(1) One of the two screw bolts used to mount the microswitches installed in the throttle control linkage component was missing, and the microswitch ground wire was disconnected.

(2) A gear warning was not activated even when the throttle (engine output) was in a condition for landing, with the gear in a raised condition.

* This information dissemination is published on the JTSB website.
http://www.mlit.go.jp/jtsb/iken-teikyo/JA385720150426.pdf

Column

The 3rd ICAO Asia Pacific Accident Investigation Group Conference

Aircraft Accident Investigator

The 3rd ICAO (International Civil Aviation Organization) Asia Pacific Accident Investigation Group Conference was held for 2 days starting on June 23, 2015, in Colombo, Sri Lanka.

The ICAO currently has 7 regional offices, with its Asia Pacific regional office located in Bangkok, Thailand. This office is involved in coordination with 38 officially-contracted countries, one non-contracted country, and 15 regions.

This conference was the first to be attended by India and Papua New Guinea, with participation by 17 countries, 1 region, IFALPA (The International Federation of Air Line Pilots' Associations), IATA (The International Air Transport Association), and 2 aircraft manufacturers.

Singapore acted as the host country, and began by confirming the current status of matters adopted in the 2nd conference, which was held in Hong Kong in 2014.

After this, active discussions were held regarding recent ICAO trends, which was one of the conference topics, on the necessity of becoming able to track data over a wider range than is possible currently due to past experiences including the inability to obtain flight information from the Malaysia Airlines Flight 370 accident, and on threats to civil aviation in regions of conflict related to Malaysia Airlines Flight 17, which was shot down in the Ukraine.

Furthermore, detailed reports regarding the undersea recovery of flight recording equipment and voice recording equipment from the AirAsia Flight 8501 accident were provided as well.

Participants also gave presentations on the importance of accident investigation-related training and studies, and voluntary reporting systems.

Through the series of conference topics and reports, a strong sense of the importance of international cooperation could be felt. We fully realized that in order to accomplish such cooperation, it will be essential to actively participate in international conferences like this one, so that we can recognize the current situations of various countries, and build relationships between countries even in the time between meetings.

The final content of the conference included presenting requests to the ICAO Asia Pacific Regional Office and announcing that the 4th conference will be held in Japan in 2016, after which the proceedings were then approved and the conference was adjourned.

During the 2 days after the conference from June 25, the participants who had attended up to the previous day joined aviation-related parties from Sri Lanka to participate in an ICAO Asia Pacific Regional Aviation Accident Workshop, where 20 presentations were given on accident investigations, accident investigation technology, and initiatives related to accident investigations. The JTSB gave a presentation on "Preventing Accidents Caused by Turbulence" which was also covered in the JTSB Digests. This presentation received comments from several groups stating that its content was fascinating, and invited questions about the JTSB Digests which were its foundation.

9 Summaries of major aircraft accident and serious incident investigation reports (case studies)

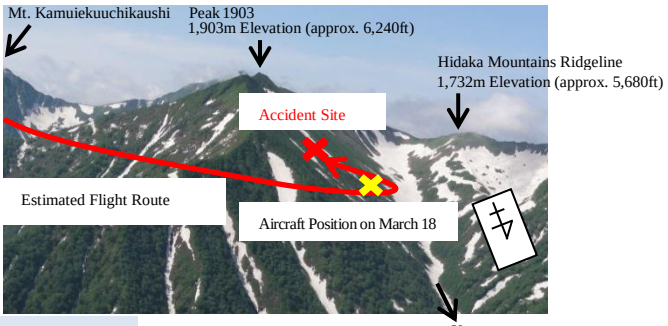
Collision with the slope of a mountain during a leisure flight

Privately Owned Hoffman H-36 Dimona, JA2405

Summary: On Friday, March 15, 2013, a privately owned Hoffmann H-36 Dimona, registered JA2405, took off from Memanbetsu Airport at 09:08 Japan Standard Time (JST: UTC+9hr, unless otherwise stated all times are indicated in JST on a 24-hour clock) for a recreational flight to Shikabe Airfield in Shikabe, Kayabe-gun, Hokkaido, and the aircraft went missing during the flight. On Monday, March 18, 2013, the aircraft was found on the northwest slope of a mountain 1,903 m in elevation, located about 1.7 km north of Mt. Kamuiekuuchikaushi, in Nakasatsunaimura, Kasai-gun, Hokkaido.
Both the pilot and the passenger on board the aircraft suffered fatal injuries.
The aircraft was destroyed but there was no outbreak of fire.

Findings

The pilot tried to climb by taking advantage of an anabatic wind generated on the windward side of Peak 1903. But the pilot failed to do it well. At around 11:00:30, the Aircraft, in a nose-up attitude parallel with the slope, eventually crashed beneath the bottom of the fuselage against a slope of approximately 1,800 m in elevation, with heading southeastward.
The slope was covered with snow. It is highly probable that the Aircraft had slid down to the position located approximately 1,600 m in elevation after the crash.



While the Aircraft decreased its ground speed against the downdraft, the pilot judged that the Aircraft would be able to maintain the altitude to safely pass over the ridgeline, and began to approach Kyunosawa Valley at an altitude of approximately 2,000 m, where the accident occurred. However, as the downdraft became stronger than the pilot had expected, he could not stop descent. It is probable that the Aircraft approached the valley at an altitude with almost no margin, in hindsight. It is probable that approaching the valley at an altitude with almost no margin was one of the reasons why the Aircraft had descended below the safe altitude.

The aircraft

Flight over Mountainous

When pilots fly over mountainous areas by visual flight rules, it is necessary to comply with the following basic points:

(1) Comprehension of Weather Conditions

The weather in mountainous areas is prone to change, which could lead to the occurrence of sharp declines in visibility, turbulence, strong downdrafts, and others. These changes in weather may affect safe flights in some cases. In addition, there are only a limited number of meteorological observation facilities in mountainous areas.

For this reason, not to mention accurately confirming weather conditions prior to flight, it is absolutely necessary to always check the conditions continuously during flight, and consider their effects on the flight.

(2) Flexibility of Flight Plans

Based on weather conditions obtained prior to flight, a flight plan should be carefully prepared. At the same time, during a flight over a mountainous area, where the meteorological environment is prone to change, it is necessary to consider safety the highest priority and to flexibly modify the flight plan according to the situation, without sticking to the initial plan.

Probable causes: It is highly probable that this accident occurred when the Aircraft, flying over the Hidaka Mountains, encountered a downdraft that was blowing down from the ridgeline of the mountains which made the Aircraft descend below the altitude needed to safely pass over the ridgeline and crash into a slope on the mountain; consequently, the aircraft was destroyed, and the pilot and the passenger suffered fatal injuries.

It is probable that the reasons that the Aircraft descended below the altitude were that while the Aircraft decreased its ground speed against the downdraft, the pilot judged that the Aircraft would be able to maintain the altitude to safely pass over the ridgeline and the Aircraft began to approach Kyunosawa Valley, where the accident occurred, at an altitude with almost no margin. Along with this, the downdraft became stronger than the pilot had expected and the pilot could not stop descent with the climb performance of the Aircraft.

For details, please refer to the investigation report. (Published on February 26, 2015)
http://www.mlit.go.jp/jtsb/eng-air_report/JA2405.pdf

Collision with a tower for high-voltage power transmission lines during a flight to take photographs

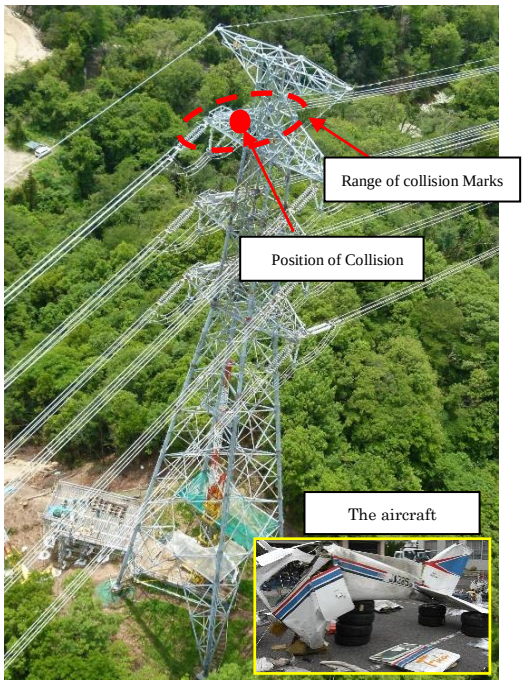
Privately Owned Cessna 172M Ram, JA3853

Summary: A privately owned Cessna 172M Ram, registered JA3853, took off from Nagoya Airfield at around 11:39 Japan Standard Time (JST: UTC+9hr: unless otherwise stated all times are indicated in JST) to take aerial photographs on Wednesday, March 5, 2014. During the flight towards the Omaezaki area, the aircraft collided with a tower for high voltage power transmission lines set up on the ridge of the hilly area of Sasahara-cho, Toyota City, Aichi Prefecture at around 11:47. The aircraft was destroyed and scattered; accordingly, post-crash fire broke out.
A captain and a passenger were on board the aircraft and both of them suffered fatal injuries.

Findings

It is highly probable that it was difficult to keep the visual meteorological conditions throughout the route during the flight because, the Officer advised that the weather on the route was quite bad, and multiple witnesses commented that it was poor visibility at the time of the accident occurred and additionally, the rain cloud covered the sky in Tokai district and the radar echo was observed from the Nagoya Airfield to the Okazaki area.

The photographing was scheduled on March 5, the maintenance of the Aircraft was planned to be started on March 7, and the planned delivery date of the ship which was the last shooting chance was the day of the airworthiness certificate inspection for the airworthiness certification. Considering these facts, it is probable that the captain forced the flight knowing that it would be difficult to make a flight maintaining the visual meteorological conditions.



《Immediately before the Collision》

The Aircraft needed to achieve an altitude of 150 m or more from the ground surface according to the requirement as it flew over from the city area to the hilly area. According to the GPS data and the ground surface elevation, it is probable that the Aircraft did not comply with the requirement of the minimum safety altitude.

《Conditions at the Time of the Collision》

According to the collision marks, it is somewhat likely that the captain lowered the left main wing on the side of the captain seat to have visual contact with the ground surface by lowering the altitude, or that the captain who had visual contact with the Tower tried to avoid the collision by suddenly lowering the left main wing and turning the Aircraft immediately before the collision.

Probable causes: It is highly probable that the Aircraft collided with the Tower for high voltage power transmission lines set up on the ridge of the hilly area because it flew below the minimum safety altitude while it flew from the Nagoya Airfield towards the Omaezaki area under the visual flight rules.

It is somewhat likely that the Aircraft tried to have visual contact with the ground surface by flying below the minimum safety altitude because the visibility was very poor, and cloud was in a low state due to the weather conditions that day.

It is highly probable that the captain forced the flight because the schedule was tight, even though the captain was aware of the difficulty to make the flight while maintaining the visual meteorological conditions.

Safety Actions Safety Actions Taken by Civil Aviation Bureau of Ministry of Land, Infrastructure, Transport and Tourism

Upon the occurrence of the accident, on March 7, 2014, the Civil Aviation Bureau issued a document entitled “Ensuring Safety for Flights with Visual Flight Rules” to the president of the Japan Aircraft Pilot Association and All Japan Air Transport and Service Association, to request that they once again to give guidance on ensuring the safety of flights under the visual flight rules to the members of their organizations. (For points of concern (excerpt), please refer to the Accident Investigation Report)

For details, please refer to the investigation report. (Published on April 23, 2015)
http://www.mlit.go.jp/jtsb/eng-air_report/JA3853.pdf

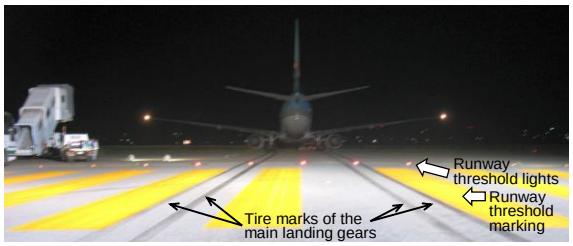
Overrun due to inability to stop within runway

Korean Air Lines Co., Ltd. Boeing 737-900, HL7599

Summary: On Monday, August 5, 2013, a Boeing 737-900, registered HL7599, operated by Korean Air as the scheduled flight KAL 763, was unable to stop within the runway 10 in Niigata Airport after landing, and came to rest with the nose gear trespassing into the grass area of the easterly end of the runway at 19:42 Japan Standard Time.
A total of 115 persons on board, including a captain, eight crewmembers, and 106 passengers did not suffer any injuries.

Findings

The aircraft



Captain had not flown to Niigata Airport for more than a year and a half, and the F/O had never experienced to land at night on RWY 10 in Niigata Airport.
It is highly probable that the Captain and the F/O had a heavy workload, such as the verifying of the exit taxiway as well as the control for reducing speed and callout after landing, since the Captain and the F/O were not familiar with Niigata Airport which had a intersecting runway, while ground objects and others which pilots could observe during a night landing were limited. It is also somewhat likely that it was difficult for the Captain and the F/O to feel how fast they are in the low speed ground roll area in which they did not count on the airspeed indicator.

According to the DFDR records, it is probable that the Captain could not take sufficient control of reducing speed with manual braking because of the following reasons:
- The Captain normally judges the runway remaining length with using runway centerline lights, which varies in color according to length, though, the Captain could not notice the remaining length of the runway.
- The F/O was also saying that the Aircraft was slightly too fast to stop short of the red lights.
- The brake pressures had dropped after the disarming of the autobrakes.

Since the Captain and the F/O had already recognized that they were not allowed to vacate from the intersecting RWY 04/22, it is highly probable that they had intended to continue rolling until TWY-B1, the end of the runway, as being conscious of the sequence that passing over the side of TWY-P3 and then crossing the intersecting runway. However, the Captain had the Aircraft continuously roll in parallel with looking for the intersection with RWY 04/22 which was assumed far ahead, having trouble to figure out the position; therefore, it is somewhat likely that those circumstances contributed that the Captain did not let the Aircraft reduce enough lower speed.

Probable causes (Excerpt): It is highly probable that this serious incident occurred when the Aircraft landed on RWY 10 in Niigata Airport, the Captain did not let the Aircraft reduce enough lower speed to approach the runway threshold lights that the Captain understood as the stop bar lights for the intersecting RWY 04/22, which the Captain was holding a doubt, and when the Captain realized there was no runway beyond the red lights, the Aircraft could not stop within the runway anymore, resulting in overrunning.
It is also somewhat likely that the following reasons contributed to the occurrence of this serious incident:
- The Captain and the F/O were not familiar with Niigata Airport which had a intersecting runway, and they had difficulty to identify the intersecting position with RWY 04/22 because ground objects and others which pilots could observe during night landing were limited. In such circumstances, it was difficult for them to judge the speed of the Aircraft in the low speed area in which they did not count on the airspeed indicator.

Safety Actions

Safety Actions Taken by the Company

In order to prevent the occurrence of similar incidents, the company revised its regulations (FOM, POM, QRH) and as a review of its training procedures, also set the number of landings with flaps at 40 to a minimum of 10 for a Captain and a minimum of 5 for a F/O in its training for the Boeing 737.

For details, please refer to the serious incident investigation report. (Published on January 29, 2015)
http://www.mlit.go.jp/jtsb/eng-air_report/HL7599.pdf

Occurrence of fire within the engine fire-prevention area

J-AIR Corporation Bombardier CL-600-2B19, JA206J

Summary: On Monday, May 6, 2013, a Bombardier CL-600-2B19, registered JA206J, operated by J-AIR Corporation, took off from Oita Airport as the scheduled flight 2362 of Japan Airlines Corporation, a code-sharing partner, and landed on runway 32R at Osaka International Airport. While the aircraft was taxiing on the taxiway after landing, a caution message was displayed for a right engine fire detection system failure at around 12:15 Japan Standard Time (JST: UTC+9hr), and subsequently a warning message was displayed for a right engine fire. While the crew responded to the engine fire warning message, the aircraft continued to taxi and entered the parking spot. During maintenance work after the flight, evidence of fire was found within the engine fire-prevention area.

A total of 55 persons were on board the aircraft, including the captain, two crew members, and 52 passengers. There were no injuries.

Findings

Details of the Outbreak of the Fire

《Identification of flammable fluid Source》

It is highly probable that the flammable materials susceptible to ignition were fuel and oil. Because fuel leakage was found and because phosphorous, a unique element contained in engine oil, was not detected in the soot composition collected, it is highly probable that the leaked fuel ignited and caused the fire to occur.

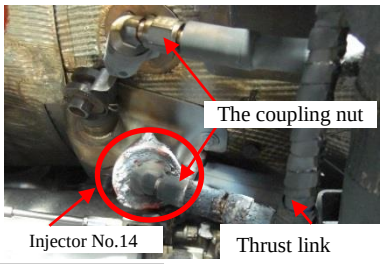
《Occurrence of Fuel Leakage》

There was loosening in the B nut connecting injector No. 14 and the manifold, which caused fuel leakage to occur.

《Ignition of the Leaked Fuel》

When the Aircraft was on the ground, the thrust reversers were used for approximately 19 seconds from 12:14:40, immediately after landing. It is highly probable that this caused both the engine RPM and internal temperature to increase and that the reduction in aircraft speed caused a reduction in the quantity of cooling and ventilation air.

Exterior view of the right engine



Evidence of fire

Probable causes: It is highly probable that the cause of this serious incident was that because the coupling nut connecting the right engine manifold and injector No. 14 was loose, fuel leaked from this area and was ignited by the heat of the engine, which caused fire within the engine fire zone.

Although it is somewhat likely that the reason why the coupling nut was loose was the insufficient tightening force of the coupling nut, resulting in gradually loosening caused by factors such as engine vibration, the JTSB couldn't determine the cause of the loosening.

Other Safety Related Findings

During this serious incident, it is certain that it took time for the flight crew members to respond to the emergency of the engine fire warning message, and that they moved the Aircraft into the parking spot as is without facing it into the wind and stopping it while the engine fire warning message was being displayed.

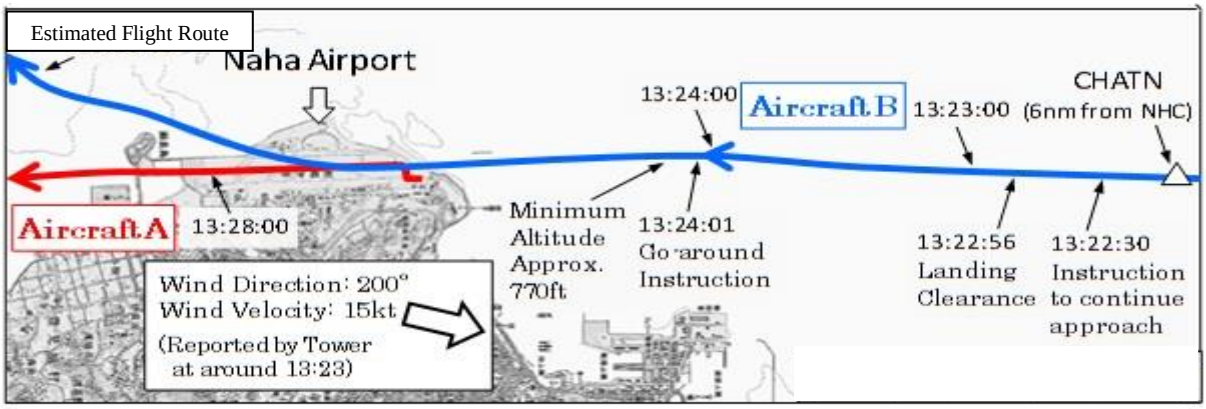
It is probable that it took time to respond to the engine fire warning message because the flight crew members suspected that it was a false alarm.

For details, please refer to the serious incident investigation report. (Published on February 26, 2015)
http://www.mlit.go.jp/jtsb/eng-air_report/JA206J.pdf

Go-around due to incursion onto Naha Airport runway

China Eastern Airlines Co., Ltd. AirAsia Japan Co., Ltd.

Summary: On July 5 (Thursday), 2012, an Airbus A319-112, registered B2332 (hereinafter referred to as "Aircraft A"), operated by China Eastern Airlines Co., Ltd., was taxiing toward Runway 18 at Naha Airport in order to depart for Shanghai (Pudong) Airport as the scheduled Flight 2046 of the company. Meanwhile, an Airbus A320-214, registered JA01AJ (hereinafter referred to as "Aircraft B"), operated by AirAsia Japan Co., Ltd., was on the final approach after receiving a landing clearance for Runway 18 at Naha Airport during the flight test required before commencing commercial transport services.
Although an air traffic controller instructed Aircraft A to hold short of the runway, the aircraft entered the runway; as a result, Aircraft B made a go-around following the instructions from the air traffic controller.



Findings

Conditions of Aircraft A

○ The flight crewmembers could not find Aircraft B, which was on approach 3 nm or thereabouts away from the threshold of the runway with its illuminated landing lights, in the weather conditions where there were no visibility restrictions, it is somewhat likely that the flight crewmembers misunderstood that they were allowed to enter the runway and minded that there was no arriving aircraft.

○ It is probable that this deceleration was to perform the Before Takeoff Checklist before entering the runway. Subsequently, the brakes were not applied, and the speed of Aircraft A was slightly increased to 8 kt as it passed the runway holding position marking; therefore, it is probable that the flight crewmembers of Aircraft A had no doubt about entering the runway.
From these points, it is probable that the flight crewmembers misheard the instruction to hold short of the runway as an instruction to hold on the runway and misunderstood that they got an approval to enter the runway.

Conditions of Aircraft B

○ Although they had the Naha Airport runway in sight from about 8 nm away, they did not sight Aircraft A, which was entering the runway, and they did not remember hearing any hold instruction issued by the Tower to Aircraft A. Therefore, it is highly probable that while Aircraft B was on the approach to Runway 18, it did not notice the presence of Aircraft A and only executed a go-around by following the instruction from the Tower.

○ Aircraft B executed a go-around without noticing the presence of Aircraft A, according to the DFDR records of Aircraft B, the radio altitude of Aircraft B when turning to climb by following the go-around instruction from the Tower was about 770 ft, and its position at the moment was about 2.1 nm from the threshold of the runway; therefore, it is probable that Aircraft B went around without any difficulty.

Probable causes (Excerpt): It is highly probable that the serious incident occurred because the departing aircraft (Aircraft A) made an incursion onto the runway despite being instructed to hold short of the runway, causing the arriving aircraft (Aircraft B), which had already been cleared to land, to attempt to land on the same runway.

It is highly probable that Aircraft A entered the runway because the flight crewmembers of the aircraft misheard and misunderstood the instruction to hold short of the runway as an instruction to hold on the runway and could not find the arriving aircraft, as well as because the Tower Controller did not recognize that the readback from Aircraft A was incorrect and consequently did not confirm or correct the readback.

For details, please refer to the serious incident investigation report. (Published on May 28, 2015)
http://www.mlit.go.jp/jtsb/eng-air_report/B2332-JA01AJ.pdf

Chapter 4 Railway accident and serious incident investigations

1 Railway accidents and serious incidents to be investigated

<Railway accidents to be investigated>

◎ **Paragraph 3, Article 2 of the Act for Establishment of the Japan Transport Safety Board**

(Definition of railway accident)

The term "Railway Accident" as used in this Act shall mean a serious accident prescribed by the Ordinance of Ministry of Land, Infrastructure, Transport and Tourism among those of the following kinds of accidents; an accident that occurs during the operation of trains or vehicles as provided in Article 19 of the Railway Business Act, collision or fire involving trains or any other accidents that occur during the operation of trains or vehicles on a dedicated railway, collision or fire involving vehicles or any other accidents that occur during the operation of vehicles on a tramway.

◎ **Article 1 of Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board** (Serious accidents prescribed by the Ordinance of Ministry of Land, Infrastructure, Transport and Tourism, stipulated in paragraph 3, Article 2 of the Act for Establishment of the Japan Transport Safety Board)

1 The accidents specified in items 1 to 3 inclusive of paragraph 1 of Article 3 of the Ordinance on Report on Railway Accidents, etc. (the Ordinance) (except for accidents that involve working snowplows that specified in item 2 of the above paragraph);

2 From among the accidents specified in items 4 to 6 inclusive of paragraph 1 of Article 3 of the Ordinance, that which falls under any of the following sub-items:

(a) an accident involving any passenger, crew, etc. killed;

(b) an accident involving five or more persons killed or injured;

(c) a fatal accident that occurred at a level crossing with no automatic barrier machine;

(d) an accident found to be likely to have been caused owing to a railway officer's error in handling or owing to malfunction, damage, destruction, etc. of the vehicles or railway facilities, which resulted in the death of any person;

3 The accidents specified in items 4 to 7 inclusive of paragraph 1, Article 3 of the Ordinance which are found to be particularly rare and exceptional;

4 The accidents equivalent to those specified in items 1 to 7 inclusive of paragraph 1, Article 3 of the Ordinance which have occurred relevant to dedicated railways and which are found to be particularly rare and exceptional; and

5 The accidents equivalent to those specified in items 1 to 3 inclusive which have occurred relevant to a tramway, as specified by a public notice issued by the Japan Transport Safety Board.

[Reference] The accidents listed in each of the items of paragraph 1, Article 3 of the

Ordinance on Reporting on Railway Accidents, etc.

Item 1: Train collision
Item 2: Train derailment
Item 3: Train fire
Item 4: Level crossing accident
Item 5: Accident against road traffic
Item 6: Other accidents with casualties
Item 7: Heavy property loss without casualties

◎ **Article 1 of the Public Notice of the Japan Transport Safety Board** (Accidents specified by the public notice stipulated in item 5, Article 1 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board)

1 From among the accidents specified in items 1 to 6 inclusive of paragraph 1 of Article 1 of the Ordinance on Reporting on Tramway Accidents, etc. (the Ordinance), that which falls under any of the following sub-items:

(a) an accident that causes the death of a passenger, crewmember, etc.;
(b) an accident involving five or more casualties (with at least one of the casualties dead);
(c) a fatal accident that occurs at a level crossing with no automatic barrier machine;

2 The accidents specified in items 1 to 7 inclusive of paragraph 1 Article 1 of the Ordinance which are found to be particularly rare and exceptional; and

3 From among the accidents occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways mutatis mutandis as specified in paragraph 1 of Article 3 of the Ordinance on Tramway Operations, the accidents equivalent to those specified in items 1 to 3 of Article 1 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

[Reference] The accidents specified in the items of paragraph 1, Article 1 of the Ordinance on Reporting on Tramway Accidents, etc.

Item 1: Vehicle collision
Item 2: Vehicle derailment
Item 3: Vehicle fire
Item 4: Level crossing accident
Item 5: Accidents against road traffic
Item 6: Other accidents with casualties
Item 7: Heavy property loss without casualties

Railway accidents to be investigated

<table>
<tr><th>Category</th><th>Train collision*2)</th><th>Train derailment*2)</th><th>Train fire*2)</th><th>Level crossing accident</th><th>Accident against road traffic</th><th>Other accidents with casualties</th><th>Heavy property loss without casualties</th></tr>
<tr><td rowspan="2">Railway (including tramway operated as equivalent to railway)
[Notice 1-3]</td><td colspan="3" rowspan="2">All accidents*1)
(These refer to train accidents and do not include vehicle accidents on railways.
[Ordinance 1-1]</td><td colspan="3">・ Accidents involving the death of a passenger, crew member, etc
・ Accidents involving five or more casualties with at least one of the casualties dead
・ Fatal accidents that occur at level crossings with no automatic barrier machines
・ Accidents found to have likely been caused by a railway worker's error in procedure or due to the malfunction, damage, destruction, etc., of vehicles or railway facilities, which resulted in the death of a person
[Ordinance 1-2]</td><td></td></tr>
<tr><td colspan="4">Accidents that are particularly rare and exceptional
[Ordinance 1-3]</td></tr>
<tr><td>Dedicated railway</td><td colspan="7">Accidents that are particularly rare and exceptional [Ordinance 1-4]</td></tr>
<tr><td rowspan="2">Tramway [Ordinance 1-5]</td><td colspan="6">Accidents involving the death of a passenger, crewmember, etc., accidents involving five or more casualties with at least one of the casualties dead, and fatal accidents that occur at level crossings with no automatic barrier machines.
[Notice 1-1]</td><td></td></tr>
<tr><td colspan="7">Accidents that are particularly rare and exceptional [Notice 1-2]</td></tr>
</table>

*1 Except for derailment accidents of working snowplows. [Ordinance 1-1]
However, accidents that are particularly rare and exceptional are to be investigated. [Ordinance 1-3]

*2 If these categories occur on a tramway, the accident types shall each be renamed to “vehicle collision”, “vehicle derailment”, or “vehicle fire”.

(Note) “Ordinance” refers to the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board; “Notice” refers to the Public Notice by the Japan Transport Safety Board; and the numbers refer to the Article and paragraph numbers.

< Railway serious incidents to be investigated>

◎Item 2, paragraph 4, Article 2 of the Act for Establishment of the Japan Transport Safety Board (Definition of railway serious incident)

A situation, prescribed by the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism (Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board), deemed to bear a risk of accident occurrence.

◎Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board

(A situation prescribed by the Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism, stipulated in item 2, paragraph 4, Article 2 of the Act for Establishment of the Japan Transport Safety Board)

1 The situation specified in item 1 of paragraph 1 of Article 4 of the Ordinance on Reporting on Tramway Accidents, etc. (the Ordinance), wherein another train or vehicle had existed in the zone specified in said item;

[A situation where a train starts moving for the purpose of operating in the relevant block section before completion of the block procedure: Referred to as "Incorrect management of safety block."]

2 The situation specified in item 2 of paragraph 1 of Article 4 of the Ordinance, wherein a train had entered into the route as specified in said item;

[A situation where a signal indicates that a train should proceed even though there is an obstacle in the route of the train, or the route of the train is obstructed while the signal indicates that the train should proceed: Referred to as "Incorrect indication of signal."]

3 The situation specified in item 3 of paragraph 1 of Article 4 of the Ordinance, wherein another train or vehicle had entered into the protected area of the signal which protects the zone of the route as specified in said item;

[A situation where a train proceeds regardless of a stop signal, thereby obstructing the route of another train or vehicle: Referred to as "Violating red signal."]

4 The situation specified in item 7 of paragraph 1 of Article 4 of the Ordinance, which caused malfunction, damage, destruction, etc. bearing particularly serious risk of collision or derailment of or fire in a train;

[A situation that causes a malfunction, etc., of facilities: Referred to as "Dangerous damage in facilities."]

5 The situation specified in item 8 of paragraph 1 of Article 4 the Ordinance, which caused malfunction, damage, destruction, etc. bearing particularly serious risk of collision or derailment of or fire in a train;

[A situation that causes a malfunction, etc., of a vehicle: Referred to as "Dangerous trouble in vehicle."]

6 The situation specified in items 1 to 10 inclusive of paragraph 1 of Article 4 of the Ordinance which is found to be particularly rare and exceptional; and

[These are referred to as: item 4 “Main track overrun”; item 5 “Violating closure section for construction”; item 6 “vehicle derailment”; item 9 “Heavy leakage of dangerous object”; and item 10 “others,” respectively.]

7 The situations occurred relevant to the tramway as specified by a public notice of the Japan Transport Safety Board as being equivalent to the situations specified in the in preceding items.

○Article 2 of the Public Notice of the Japan Transport Safety Board

(A situation prescribed by the public notice stipulated in item 7, Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board (Serious incident on a tramway))

1 The situation specified in item 1 of Article 2 of the Ordinance on Reporting on Tramway Accidents, etc. (the Ordinance), wherein another vehicle operating on the main track had existed in the zone specified in said item;

[A situation where a vehicle is operating on the main track for the purpose of operating in the relevant safety zone before the completion of safety system procedures: Referred to as “Incorrect management of safety block.”]

2 The situation specified in item 4 of Article 2 of the Ordinance, which caused malfunction, damage, destruction, etc., bearing a particularly serious risk of collision, derailment of or fire in a vehicle operating on the main track;

[A situation that causes a malfunction, etc., of facilities: Referred to as “Dangerous damage in facilities.”]

3 The situation specified in item 5 of Article 2 of the Ordinance, which caused malfunction, damage, destruction, etc., bearing a particularly serious risk of collision, derailment or fire in a vehicle operating on the main track;

[A situation that causes a malfunction, etc., of a vehicle: Referred to as “Dangerous trouble in vehicle.”]

4 The situation specified in items 1 to 7 inclusive of Article 2 of the Ordinance which is found to be particularly rare and exceptional; and

[These are referred to as: item 2 “Violating red signal;” item 3 “Main track overrun;” item 6 “Heavy leakage of dangerous object;” and item 7 “others,” respectively.]

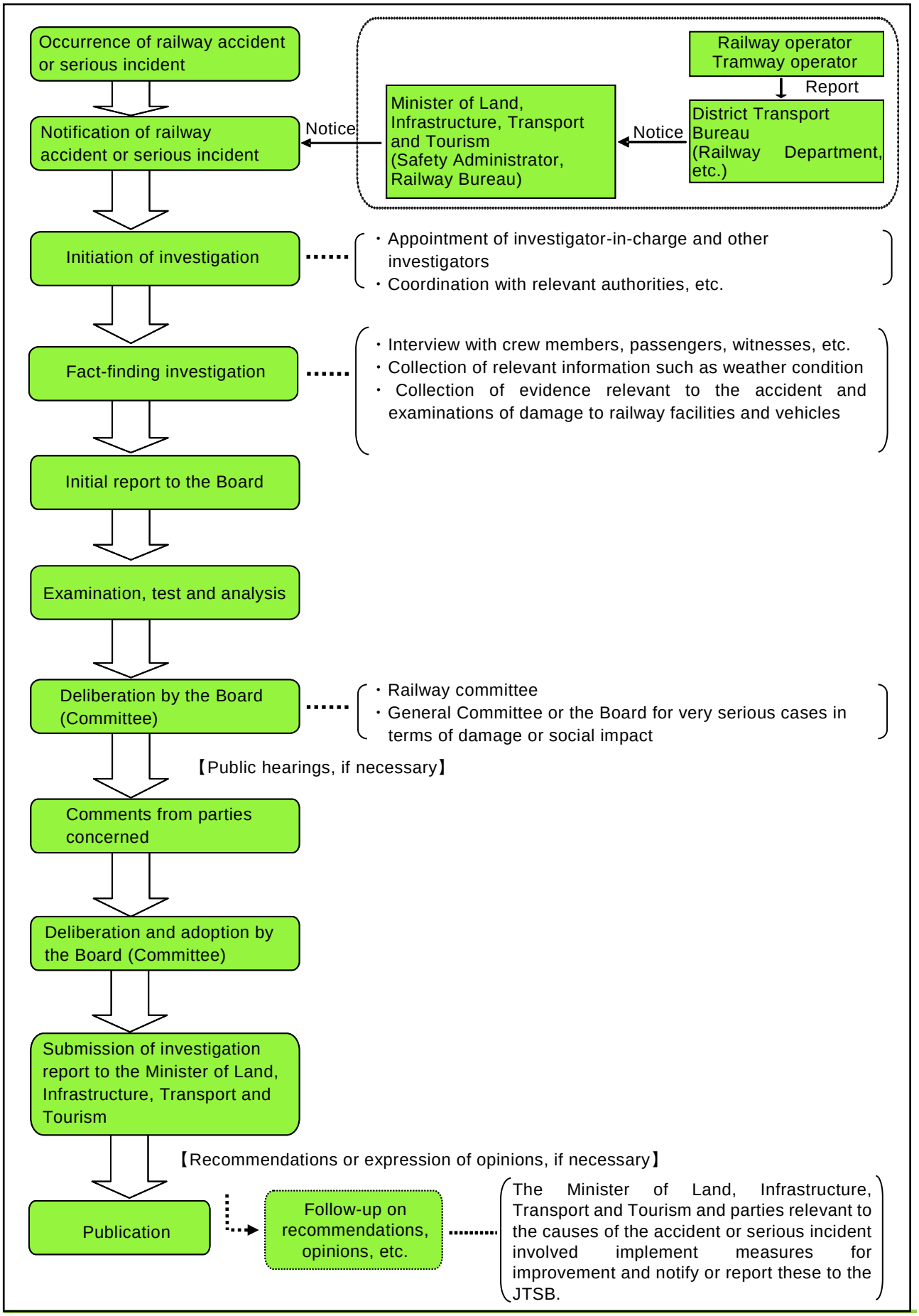
5 From among the situations occurring on a tramway operated under the application of the Ministerial Ordinances to provide Technical Regulatory Standards on Railways mutatis mutandis as specified in paragraph 1 of Article 3 of the Ordinance on Tramway Operations, the situations equivalent to those specified in items 1 to 6 of Article 2 of the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board.

Serious incidents to be investigated

<table>
<tr><th>Category</th><th>・Incorrect management of safety block (Railway)
・Incorrect management of safety block (Tramway)</th><th>・Incorrect indication of signal (Railway)
・Violating red signal</th><th>Dangerous damage in facilities</th><th>Dangerous trouble in vehicle</th><th>・Main track overrun
・Violating closure section for construction (Railway)
・Vehicle derailment (Railway)
・Heavy leakage of dangerous object
・Others</th></tr>
<tr><td rowspan="2">Railway
(including tramway operated as equivalent to railway)
[Notice 2-5]</td><td colspan="2">Certain conditions such as the presence of another train
[Ordinances 2-1, 2-2, and 2-3]</td><td colspan="2">Risk of collision, derailment or fire
[Ordinances 2-4 and 2-5]</td><td></td></tr>
<tr><td colspan="5">Incidents that are particularly rare and exceptional [Ordinance 2-6]</td></tr>
<tr><td rowspan="2">Tramway
[Ordinance 2-7]</td><td>Certain conditions such as the presence of a vehicle
[Notice 2-1]</td><td></td><td colspan="2">Risk of collision, derailment or fire
[Notices 2-2 and 2-3]</td><td></td></tr>
<tr><td colspan="5">Incidents that are particularly rare and exceptional [Notice 2-4]</td></tr>
</table>

(Note) “Ordinance” refers to the Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board; “Notice” refers to the Public Notice by the Japan Transport Safety Board, and the numbers refer to the Article and paragraph numbers.

2 Procedure of railway accident/incident investigation



3 Statistics for the investigations of railway accidents and serious incidents

In 2015, the JTSB carried out investigations of railway accidents and serious incidents. The results are as follows. 18 accident investigations had been carried over from 2014, and 13 accident investigations were newly launched in 2015. 18 investigation reports were published in 2015, and 13 accident investigations were carried over to 2016.

Two railway serious incident investigations had been carried over from 2014, and three railway serious incident investigation were newly launched in 2015. Three investigation reports were published in 2015, and two railway serious incident investigations were carried over to 2016.

Investigations of railway accidents and incidents in 2015

(Cases)

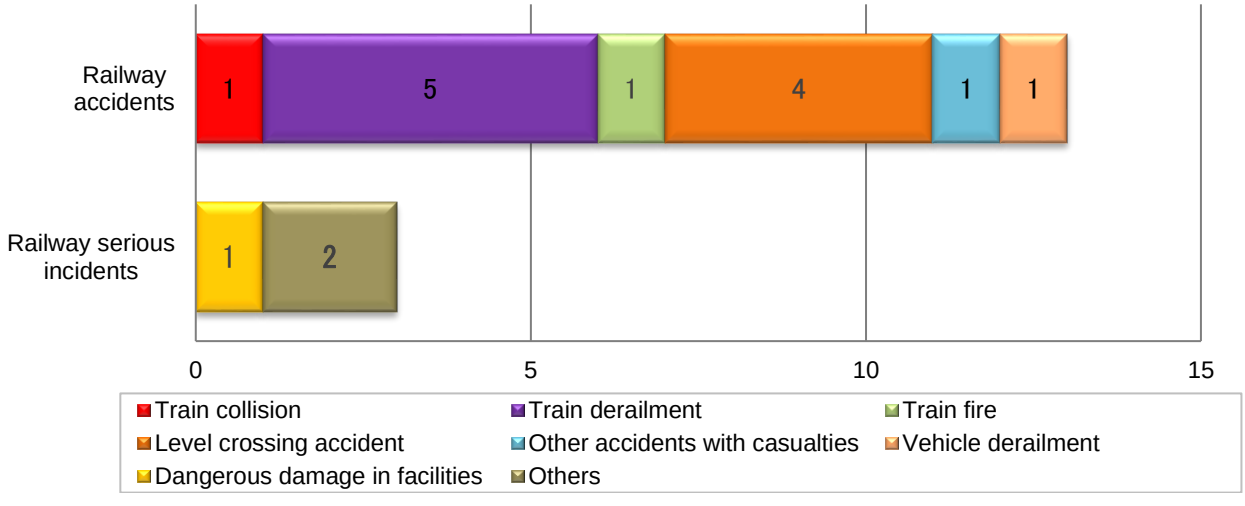
Category	Carried over from 2014	Launched in 2015	Total	Published investigation reports	(Recommendations)	(Opinions)	Carried over to 2016	(Interim report)
Railway accident	18	13	31	18	(0)	(1)	13	(0)
Railway serious incident	2	3	5	3	(0)	(0)	2	(0)

4 Statistics for investigations launched in 2015

The railway accidents and railway serious incidents that were newly investigated in 2015 consisted of 13 railway accidents (down by one from the last year associated with 14 accidents) and three railway serious incidents (Up by two from the last year associated with one incident).

The breakdown by accident categories shows that the railway accidents are comprised of one train collision, five train derailment, one train fire, four level crossing accidents, one other accidents with casualties, one vehicle derailment. The railway serious incident comprised of one dangerous damage in facilities, two others.

Number of investigated railway accidents and serious incidents by type in 2015



The number of casualties was 91 across the 13 accidents. These consisted of six death and 85 injured persons.

The number of casualties (in railway accidents)

(Persons)

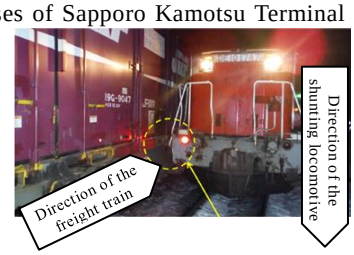
2015							
Category	Dead			Injured			Total
	Crew	Passenger	Others	Crew	Passenger	Others	
Casualties	0	2	4	4	80	1	91
Total	6			85			

5 Summaries of railway accidents and serious incidents that occurred in 2015

The railway accidents and railway serious incidents that occurred in 2015 are summarized as follows. The summaries are based on the information available at the start of the investigations, and therefore may change depending on the course of investigations and deliberations.

(Railway accidents)

1	Date and accident type	Railway operator	Line section (location)
	January 24, 2015 Train derailment	East Japan Railway Company	Between Kuwanohara Signal Station and Inariyama Station, Shinonoi Line (Nagano Prefecture)
	Summary	While traveling in the above section, a train collided with a lightweight truck that had entered the railway track, causing all axles in the front bogie of the front EMU to become derailed and causing the train to stop inside the tunnel. The driver of the lightweight truck was injured.	
2	Date and accident type	Railway operator	Line section (location)
	January 25, 2015 Train derailment	East Japan Railway Company	Between Uzen-Numazawa Station and Tenoko Station, Yonesaka Line (Yamagata Prefecture)
	Summary	While travelling in the above section, when the train left from the Utsu Tunnel, a train driver found snow that had accumulated on the tracks and applied an emergency brake, but was not in time, and the train climbed up the snow, causing all of the two axles in the front bogie of the front DMU to be derailed to the right. Although there were six passengers and a train driver on board the train, there were no injuries.	
3	Date and accident type	Railway operator	Line section (location)
	February 13, 2015 Level crossing accident	West Japan Railway Company	Hachininyama level crossing, class one level crossing with automatic barrier machine and road warning device, between Nishiachi Station and Shin-Kurashiki Station, Sanyo Line (Okayama Prefecture)
	Summary	A train driver confirmed that the obstruction warning signal at Hachininyama level crossing was indicating a stop signal, and at the same time confirmed a common freight truck stopped within the level crossing. Immediately, he applied the emergency brake and sounded the whistle but was not in time, and the train collided with the freight truck. There were about 300 passengers, a train driver, and a conductor on board the train. Of these, 44 passengers and the train driver were injured. The driver of the freight truck escaped outside of the level crossing at the time of the collision, and was not injured. The train was damaged at the front part of the front vehicle	

		and the right side between the front and second vehicles, but did not become derailed. Although the freight truck was completely demolished, a fire did not break out.
4	Date and accident type	Railway operator	Line section (location)
	February 17, 2015 Train collision	Japan Freight Railway Company	In the premises of Sapporo Kamotsu Terminal Station, Hakodate Line (Hokkaido Prefecture)
	Summary	When a shunting locomotive was operating from Shiraishi Passage Line to the So-No. 2 Line of Atsubetsu Station side in the premises of Sapporo Kamotsu Terminal, the locomotive passed the car stop indicator toward Atsubetsu Station on that line, and stopped in a position obstructing adjacent lines. On the other hand, a high-speed freight train entered the premises of Sapporo Kamotsu Terminal Station, and when it passed alongside the shunting locomotive, a freight train driver confirmed a sound indicating contact and immediately applied an emergency brake, causing the train to stop after traveling approximately 50 m. After stopping, the driver got off the train and confirmed the state of the train. As a result, the driver discovered that the side of the front vehicle of the train had collided with the shunting locomotive.  Although there was a driver on board the train and a driver on board the shunting locomotive, there were no injuries.
5	Date and accident type	Railway operator	Line section (location)
	June 19, 2015 Level crossing accident	Toyama Chihou Railroad Co., Ltd.	Kitaura level crossing, class four level crossing without automatic barrier nor road warning device, between Chigozuka Station and Tazoe Station, Tateyama Line (Toyama Prefecture)
	Summary	While traveling in the above section, a train collided with a pedestrian passing through Kitaura level crossing. The one pedestrian died.
6	Date and accident type	Railway operator	Line section (location)
	June 30, 2015 Train fire	Central Japan Railway Company	Between Shin-Yokohama Station and Odawara Station, Tokaido Shinkansen (Kanagawa Prefecture)
	Summary	While traveling in the above section, the train's emergency buzzer in the second car was activated. Therefore, a train driver applied braking operations, with the train stopping approximately 8 km before Odawara Station. When the driver checked the situation after stopping, he confirmed that there was a passenger on fire in an aisle in the cabin of the first car, and used a fire extinguisher to put out the fire. The conductor also discovered that one female passenger had collapsed on the Tokyo-side deck in the same car. Two passengers died and 26 passengers were injured (one with serious injuries).
7	Date and accident type	Railway operator	Line section (location)
	August 8, 2015 Other accident with casualties	West Japan Railway Company	In Shiroumaru Tunnel, between Kokura Station and Hakata Station, Sanyo Shinkansen (Fukuoka Prefecture)
	Summary	While traveling in the above section, a train driver confirmed a power outage and stopped a train using an emergency brake. After the train had stopped, a cabin crew member was informed by a passenger seated in the left window seat of the fourth row from the front in the third vehicle that her left arm, etc. had been injured due to a strong impact from the left side of the vehicle. The conductor, who rushed to the third vehicle after being contacted by the cabin crew member, confirmed that there was damage near the side window next to the seat of the injured passenger. Also, when the conductor inspected the train from outside, he confirmed that there were multiple damaged areas on the left side of the third vehicle. The train entered a car depot and its condition was checked, and it was found that a side cover plate mounted at the front-most part of the left side of the second vehicle was missing. When employees for power supply section in the company carried out the track patrol, the side cover plate of the train was discovered between the inbound and outbound lines in the Shiroumaru Tunnel. There were about 500 passengers, two crew members (driver, conductor) and two cabin crew members on board the train. Aside from the one injured passenger mentioned above, there were no injuries.
8	Date and accident type	Railway operator	Line section (location)
	August 26, 2015 Level crossing accident	West Japan Railway Company	Kagiya No. 1 level crossing, class four level crossing without automatic barrier nor road warning device, between Nishitakaya Station and Shiraichi Station, Sanyo Line (Hiroshima

			Prefecture)
	Summary	While traveling in the above section, a train driver confirmed a lightweight freight truck that had entered the Kagiya No. 1 level crossing and applied an emergency brake, but a train collided with the freight truck. A driver of the freight truck died as a result of this accident.	
9	Date and accident type	Railway operator	Line section (location)
	October 11, 2015 Vehicle derailment	Nagasaki Electric Tramway Co., Ltd.	Between Suwa-Jinja-Mae tram stop and Kokaido-Mae tram stop, Sakuramachi branch line (Nagasaki Prefecture)
	Summary	While traveling through Kokaido-Mae intersection toward the Nagasaki-Eki-Mae tram stop, two axles in the rear bogie of a tram car became derailed. There were no injuries.	
10	Date and accident type	Railway operator	Line section (location)
	October 29, 2015 Train derailment	Minamiaso Railway Co., Ltd.	In the premises of Nakamatsu Station, Takamori Line (Kumamoto Prefecture)
	SUMMARY	While entering Nakamatsu Station, near the switching point, all of the two axles in the front bogie of the front vehicle became derailed to the right in the running direction. There were no injuries.	
11	Date and accident type	Railway operator	Line section (location)
	November 14, 2015 Level crossing accident	Kyushu Railway Co., Ltd.	Nakata level crossing, class four level crossing without automatic barrier nor road warning device, between Minamikata Station and Kibana Station, Nichinan Line (Miyazaki Prefecture)
	Summary	While traveling in the above section, a train driver confirmed a light motor vehicle in the Nakata level crossing and applied an emergency brake immediately. However, the train collided with the light car and stopped after running in a short distance. The driver and one fellow passenger on the light motor vehicle died.	
12	Date and accident type	Railway operator	Line section (location)
	December 11, 2015 Train derailment	East Japan Railway Company	Between Hiratsuto Station and Matsukusa Station, Yamada Line (Iwate Prefecture)
	Summary	While traveling in the above section, a train climbed up the piled-up soil that had come onto the track, and became derailed. 10 passengers were injured.	
13	Date and accident type	Railway operator	Line section (location)
	December 31, 2015 Train derailment	Shikoku Railway Company	In the premises of Orange Town Station, Kotoku Line (Kagawa Prefecture)
	Summary	In the premises of Orange Town Station, a train passed a starting signal indicating a stop signal, entering the safety siding and causing the front axle in the front bogie to become derailed. There were no injuries.	

(Railway serious incidents)

1	Date and incident type	Railway operator	Line section (location)
	April 12, 2015 Dangerous damage in facilities	East Japan Railway Company	Between Kanda Station and Akihabara Station, Yamanote Line and Keihin-Tohoku Line (Tokyo Metropolitan)
	Summary	In the above section, a support column (electrification pole) supporting overhead lines scheduled for removal as part of improvement works on overhead line equipment fell and blocked the tracks. A driver of a north-bound Keihin-Tohoku Line train (bound for Omiya Station) saw the fallen electrification pole in the above section, sent an alarm around trains by using the train protection radio, and reported to the dispatcher. For this accident, the operation on Yamanote Line and Keihin-Tohoku Line were suspended. It was confirmed that the fallen electrification pole had been tilting on the night of April 10, and it would be repaired on the night of April 13. There were no injuries.	
2	Date and incident type	Railway operator	Line section (location)
	May 17, 2015 Others	Hokkaido Railway Company	In the premises of Yakumo station, Hakodate Line (Hokkaidou Prefecture)
	Summary	On May 17, 2015, the conductor in charge of the inbound Extra Passenger Limited Express 8008 train, the Extra Sleeper Limited Express Hokutosei composed of 14 vehicles, starting from Sapporo station bound for Ueno station of Hokkaido Railway Company, patrolled cabins after the train departed from	

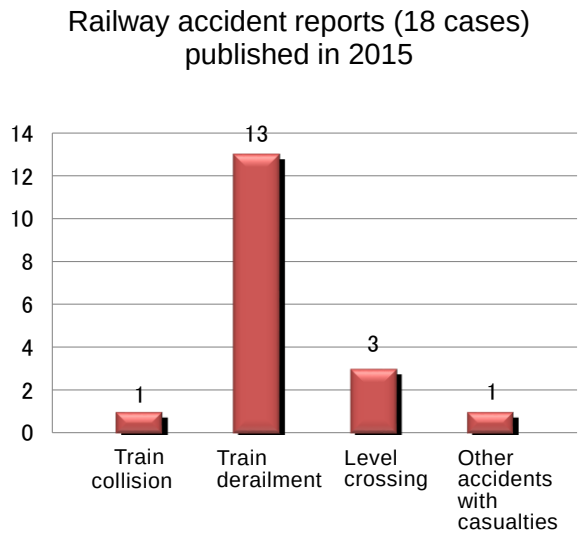
		Yakumo station at 19:51, on schedule, and found the left door for passengers in the deck of the 4th vehicle opened almost completely, and immediately closed the door manually. The train dispatcher, reported about the incident from the conductor in charge, instructed the train driver to stop the train at Otoshibe station temporarily. There were 166 passengers, 3 train crews, i.e., the driver, the conductor in charge, the assistant conductor, and 5 dining car staffs onboard the train, but there was no casualty due to fell from the train etc.
3	Date and incident type	Railway operator	Line section (location)
	May 22, 2015 Others	Kyushu Railway Company	In the premises of Hizen-Ryuo Station, Nagasaki Line (Saga Prefecture)
	Summary	When an outbound train tried to enter the No. 2 platform of Hizen-Ryuo Station, a driver of outbound train noticed unusual sounds, and applied an emergency brake to stop the train near the home signal of Hizen-Ryuo Station. After stopping at this point, operation of outbound train was resumed. When the outbound train reached a speed of approximately 35 km/h, the driver of the outbound train noticed that the outbound train entered the No.1 platform of Hizen-Ryuo Station, where an inbound train have already stopped. Therefore, the driver of the outbound train applied an emergency brake to avoid the train collision, and the outbound train stopped approximately 93 m before the inbound train. There were no injuries.

6 Publication of investigation reports

The number of investigation reports of railway accidents and serious incidents published in 2015 was 21. These consisted of 18 railway accidents and three serious incidents.

Breaking them down by category, the railway accidents contain one train collision accident, 13 train derailment accidents, three level crossing accidents and one other accidents with casualties. However, the serious railway incidents contain two dangerous trouble in vehicle and one others.

In the 18 accidents, the number of casualties was 98, consisting of four death and 94 injured persons.



Summaries of the investigation reports for railway accidents and serious incidents published in 2015 can be found on JTSB website at:

http://www.mlit.go.jp/jtsb/railrep.html

7 Actions taken in response to recommendations in 2015

Actions taken in response to recommendations were reported with regard to one serious railway incident in 2015. Summaries of these reports are as follows.

① Sangi Railway Co., Ltd.: Serious railway incident on the premises of Higashi-Fujiwara Station on the Sangi Line

(Recommendation issued on October 25, 2013)

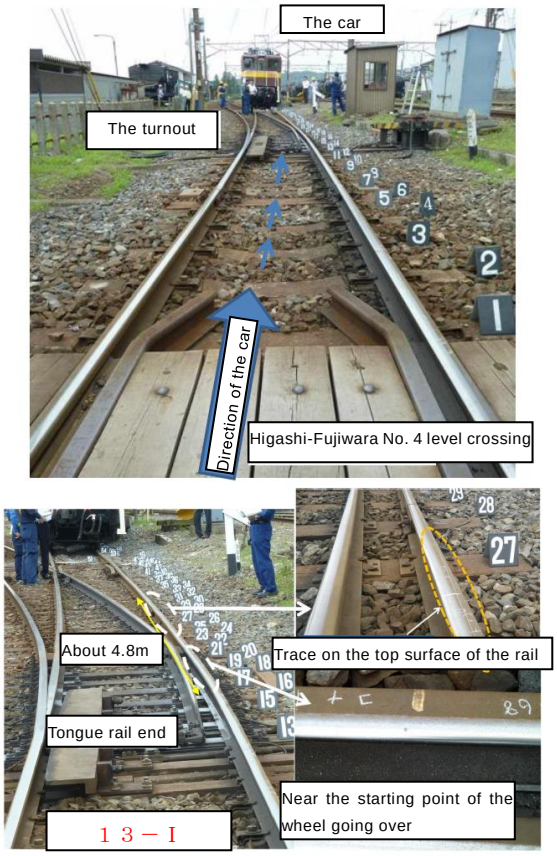
On October 25, 2013, the Japan Transport Safety Board (JTSB) published an investigation report and issued a recommendation to Sangi Railway Co., Ltd. as one of the parties relevant to the cause of the serious incident, regarding the serious railway incident that occurred on the premises of Higashi-Fujiwara Station on the Sangi Line on June 27, 2012. JTSB then received the following report regarding the measures (interim report) taken based on the recommendation.

○ Summary of the serious incident

At about 3:00 P.M. on June 27 2012, one of Sangi Railway Co., Ltd.'s 18-car shunting train (two electric locomotives and 16 freight cars) sets started from the private siding of a cement factory for the downbound main line in Higashi-Fujiwara Station.

The driver of the train set, noticing an abnormal condition when it was passing the Higashi-Fujiwara No. 13-I turnout, immediately applied the emergency brake to stop the train. The first axle in the front bogie of the second locomotive was derailed to the right.

A driver was working in the second locomotive, and two guides were in the first one, as well as a switchman in the third one. None of them were injured.



Derailment site

○ Probable causes

This serious incident occurred when the set of 18-car shunting train (two electric locomotives and 16 freight cars) was running along the section of the base line side of a turnout that goes in the same direction as the curve. The turnout was in a section that contained four consecutive curves. The situation was attributable to an increase in the derailment coefficient, which occurred at the same time as a decrease in the threshold derailment coefficient. As a result, the right wheel in the first axle of the second locomotive's front bogie subsequently ran up the outside rail and derailed to the right.

It is probable that the increase in the derailment coefficient is a result of the increase in lateral force, as well as a decrease in the wheel weight. This situation can be deduced from the following factors: the track was deformed in a direction that results in the reduction of the radius; the twist of the track increased so that the train leaned to the front right, and; it is probable that that the train was running with excess of cant, which was due to its low-speed. It is somewhat likely that the shift of the axle load due to the power running at an ascent was also a contributing factor.

It is probable that the decrease in the threshold derailment coefficient results from a shifting of track, which is associated with an excessive reduction of the radius, resulting in an increase in the angle of attack for the first axle of the front bogie.

It is probable that the rapid shifting of track and the increase in twists resulted from their poor management of the shapes and shifts of the tracks. They did not understand the specification of plain curves, or did not inspect the shifts of the tracks in the turnouts. As a result, they were not able to recognize that the state of the tracks exceeded the allowances of its maintenance criteria.

○ Description of the recommendation to Sangi Railway Co., Ltd.

Sangi Railway Co., Ltd. should make sure that their tracks are well maintained. They should do so by grasping the design values for maintenance and management and by inspecting shifts properly in accordance with the "Practice Criteria for construction works" in sections involving curves and/or turnouts.

○ Measures taken based on the recommendation (interim report)

Since specifications of curves have been clarified for curves of our Sangi main line between each station,

we have utilized them for track maintenance. However, some specifications of curves were not clarified in the main line, side lines, and curves with turnouts on the premises of each station. We had depended on the "long experience" and "review" of field workers.

As a result of investigations, we have clarified that stations, in which the specifications of curves were unclear, are 10 stations, including Tomida Station, Oyachi Station, Heizu Station, Hobo Station, Umedoi Station, Misato Station, Nyugawa Station, Ise-Hatta Station, Higashi-Fujiwara Station, and Nishi-Fujiwara Station. We took measurements in order to clarify the specifications in these stations, and performed work to define the specifications of curves one by one by reading the current curves from the survey maps. Of these, we report that work has already been completed in the premises of the 2 stations consisting of Higashi-Fujiwara Station and Umedoi Station (Sangi tetsu No. 64, dated May 28, 2014).

With regard to turnouts in each station, we have also performed work on the 3 locations, including Tomida Station Sa No. 60 turnout, No. 91 turnout, and Higashi-Fujiwara Station No. 60 turnout, which were adjusted on site due to the fact that there are no specifications (hereinafter referred to as "similar turnouts"), and will therefore also report on the completion of work on the Higashi-Fujiwara Station No. 60 turnout and on the status of work progress on the Tomida Station Sa No. 60 turnout and No. 91 turnout.

1. Actions taken for "similar curve locations"

• Tomida Station

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014.

Based on these measurement results, we have prepared line survey maps for 11 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

• Oyachi Station

We started taking measurements on January 10, 2014, and the field measurements were completed on January 18.

Based on these measurement results, we have prepared line survey maps for 3 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

• Heizu Station

We started taking measurements on December 4, 2013, and the field measurements were completed on June 25, 2014.

Based on these measurement results, we have prepared line survey maps for 2 curves, including the specification of curves in accordance with the implementing standards for construction works (completed

on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

• Hobo Station

We started taking measurements on March 4, 2014, and the field measurements were completed on April 4.

Based on these measurement results, we have prepared line survey maps for 8 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

• Misato Station

We started taking measurements on April 5, 2014, and the field measurements were completed on April 15.

Based on these measurement results, we have prepared line survey maps for 4 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

• Nyugawa Station

We started taking measurements on January 20, 2014, and the field measurements were completed on February 10.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No.90, dated November 7, 2014) regarding the new track shapes and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No.159, dated November 26, 2014). In response to this, we have implemented the construction to exchange to heavy turnouts with heavy tracks within the station in accordance with the defined track shape (37 kg → 50 kgN) (a total of 4 turnouts, including No. 11-I turnout, No. 11-Ro turnout, No. 12-I turnout, and No. 12-Ro turnout) as well as the curve improvement construction along with it by March 16, 2015. Due to these constructions, all 2 curves have been improved to the new track shapes.

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for

construction works.

• Ise-Hatta Station

We started taking measurements on February 25, 2014, and the field measurements were completed on March 3.

Based on these measurement results, we have prepared line survey maps for 5 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new specifications and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

• Nishi-Fujiwara Station

We started taking measurements on December 4, 2013, and the field measurements were completed on June 25, 2015.

Based on these measurement results, we have prepared line survey maps for 2 curves, including the specification of curves in accordance with the implementing standards for construction works (completed on June 11, 2015). We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 65, dated July 3, 2015) regarding the new track shapes and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 76, dated August 20, 2015) (work indicating the new specifications to the site was completed on August 24, 2015).

We will appropriately store the line survey maps and appropriately maintain and manage the tracks in accordance with the allowances of the maintenance criteria included in the implementing standards for construction works.

2. Actions taken for “similar turnouts”

• Higashi-Fujiwara Station No. 60 turnout

We started taking measurements on May 22, 2012, and the field measurements were completed on August 7, 2012.

Based on these measurement results, we have prepared line survey maps including the specification of curves in accordance with the implementing standards for construction works. We have applied for approval of application for modification of relevant railway facilities (Sangi tetsu No. 76, dated July 3, 2014) regarding the turnout removal and received the approval by the Director-General of the Chubu District Transport Bureau (Chu-untetsugi No. 84, dated July 14, 2014). In response to this, the turnouts were removed and the change to straight tracks was completed by January 27, 2015.

• Tomida Station Sa No. 60 turnout

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014. From here on we will proceed with the design work and plan the curve improvement work.

• Tomida Station No. 91 turnout

We started taking measurements on April 2, 2013, and the field measurements were completed on March 11, 2014. From here on we will proceed with the design work and plan the curve improvement work.

Regarding the transitional and appropriate maintenance for these Tomida Station Sa No. 60 turnout and

Tomida Station No. 91 turnout until the fundamental improvement construction is completed, we have requested the Railway Technical Research Institute to conduct a field check on December 12, 2013, and give us instructions on the maintenance method. We have decided to conduct the inspections, which are normally conducted once a year, once a month based on the advice regarding the maintenance method by the Railway Technical Research Institute until the major curve improvement is completed. We are promoting the management by using the current management figures as standards, and to this point no problems have been encountered. We will continue to use this method until the work is completed, with the aim of ensuring safety.

* The interim report, including materials, is published on the JTSB website:
http://www.mlit.go.jp/jtsb/railkankoku/railway-kankoku5re-4_20150909.pdf

8 Provision of factual information in 2015

There were no cases of provision of factual information in 2015.

Column

Outreach Lecture: About Railway Accident Investigation

Railway Accident Investigator

In order for people to find out more about the duties we are engaged in at the JTSB, and we hold "outreach lectures" to hear the opinions and the fresh voice.

On this occasion, we received a request from Maihama Resort Line Co. Ltd., a company operating monorails that travel around the Tokyo Disney Resort, with windows resembling the face of Mickey Mouse and unique designs for their hanging hand-hold straps and other elements, to dispatch speakers for an outreach lecture with the goal of "further improving the awareness of transportation safety". In response to this, we held an outreach lecture presented by two railway accident investigators on the topic "About Railway Accident Investigation".

In the outreach lecture, we provided explanations that included the duties of the JTSB, what kinds of railway accidents and railway accident indications (e.g. incidents) are investigated, how investigations are advanced when accidents or incidents to be investigated have occurred, key points for reading railway accident investigation reports, and accident case studies based on railway accident investigation reports published by the JTSB.

We also spoke about the scope and concepts of maintaining the condition of an accident or incident investigation site when we have received such requests in prior meetings with business operators.

In the question and answer session following the lecture, we received questions from the attending employees that included: "What were some difficulties in past accident investigations?", "Was the XX accident a subject of investigation?", and "What kinds of materials should be submitted if an accident occurs which is believed to have been caused by a vehicle?" It was a highly valuable opportunity for us to hear the fresh voice.

Although it was also mentioned in the lecture, since investigation results of accidents and incidents are published by the JTSB in the form of railway accident investigation reports, we hope that they can be of use not only to parties relevant to the causes of accidents and incidents, but also to other business operators and those involved with railways, who may use railway accident investigation reports for reference to improve the safety of railways in the future.

Photographs provided by: Maihama Resort Line Co., Ltd.

9 Summaries of major railway accident and serious incident investigation reports (case studies)

Tracks were not maintained properly, so lateral force occurring while a train was traveling caused the tracks to continue expanding until the train became derailed

Japan Freight Railway Company; Train derailment accident in the premises of Onuma station, Hakodate Line

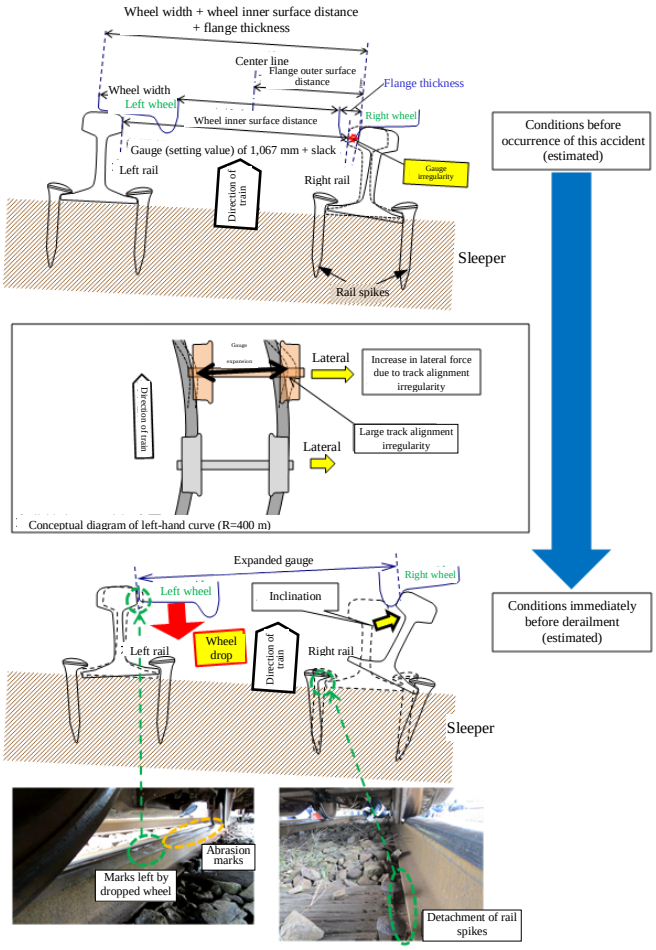
Summary: On September 19, 2013, the freight rain, composed of 18 vehicles, departed from Higashi-Muroran yard on schedule and arrived at No.2 track, passing track for up line, of Onuma station at 17:15, 2 minutes behind schedule. After that, the train driver started the train on schedule. While the train was running in powering operation at the velocity of about 20 km/h, the train driver felt the drag force from the rear and found reduction of the brake pipe pressure and increase of the brake cylinder pressure by the pressure gauges on the operator console, and immediately switched off the master controller handle. Then the train stopped just after that. After the train had stopped, the train driver got off the train and inspected the situation, and found that the all 2 axles in the rear bogie of the 6th vehicle, the all 2 axles in the front bogie of the 7th vehicle, the all 4 axles of the 8th vehicle and the all 2 axles in the front bogie of the 9th vehicle were derailed. There was the train driver alone onboard the train, but he was not injured.

Findings

It is probable that the lateral force toward the outer rail increased and made the gauge easily expand because the alignment and gauge track irregularities exceeded the maintenance standard values near the accident site. In records of track maintenance near the accident site, there were no records of maintenance on the tracks for at least 3 years prior to the occurrence of the accident and so it is probable that the required track maintenance had not been performed for an extended period of time.

It is probable that there was a lack of basic awareness in the entire Track Maintenance Management Office responsible for regular inspections of track irregularities near the accident site and maintenance based on inspection results, as a party engaging in track maintenance, and it is also probable that at the Track Maintenance Station of the Track Maintenance Management Office, which serves to supervise track maintenance management, the duties involving maintenance of the tracks by the Track Maintenance Management Office were not properly supervised, and therefore the actual conditions had not been fully understood.

It is somewhat likely that at the Track Maintenance Division of the Head Office's Engineering Department, which is responsible for planning and management so that the Track Maintenance Management Office and Track Maintenance Station reliably implement track maintenance management duties, the status of duties implemented by site organizations required for track maintenance management had not been properly confirmed, and that the actual status of duties involving track maintenance themselves had not been sufficiently confirmed as well.



*In this accident, when inspection data regarding track maintenance management was obtained from JR Hokkaido, certain portions of the data had been altered, but since data prior to the alteration was obtained and the altered portions were not directly related to the causes of the accident, the alteration had no effects on the analysis of the accident causes.

Probable causes (Excerpt): It is highly probable that the accident had occurred as the left wheels in the rear bogie of the 6th vehicle derailed to inside of the track by the lateral motion and tilting of the rail due to large lateral force generated while the train passed around the accident site, where the track was in the states that the gauge was easily widened due to the effects of the alignment extremely exceeding the maintenance standard values, by the lateral force caused by the passing trains, because the maintenance works were not implemented properly although the alignment and the irregularity of gauge exceeded the maintenance standard values extremely.

For details, please refer to the investigation report. (Published on January 29, 2015)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2015-1-4.pdf

Collision caused when required brake force could not be obtained due to materials adhering to brake shoes

Tokyu Corporation; Train collision accident in the premises of Motosumiyoshi station, Toyoko Line

Summary: On February 15, 2014, the train, composed of 8 vehicles, was running between Musashi-Kosugi station and Motosumiyoshi station, where snow were stacked on the track. The driver of the train received the instruction from the train dispatcher, to stop the train immediately to keep an interval with the preceding train, composed of 8 vehicles, which was preparing backward operation to correct the stopped position at Motoshumiyoshi station. The driver applied an emergency brake to stop the train but the train collided with the rear end of the preceding train, stopped in No. 2 track of Motosumiyoshi station, at about 00:30.

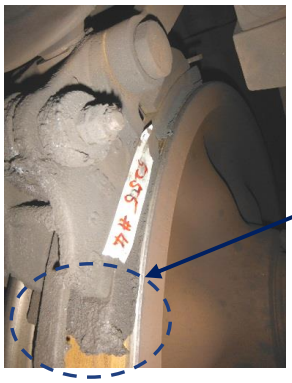
There were about 140 passengers and 4 train crews onboard the both trains and 72 passengers were injured.

Findings

There were no abnormalities confirmed in the operation of the emergency brake of the following train involved in the collision, and so it is probable that the brake shoe had pressed against the wheels, but there were accumulated deposits (hereinafter referred to as "brake shoe deposits") composed of solid matter primarily containing iron, combined with oil and other substances, on half of the brake shoes of the following train, and there was also oil adhering to the bases of the wheel flanges.

It is probable that the brake shoe deposits were a mixture of friction adjusting material (*) and oil applied to the rails (*) remaining on the treads of the wheels and the wheel flanges, that had accumulated around the brake shoes, together with abrasion powder and dust from the wheels, rails, and brake shoes, and since cleaning had not been performed on the following train after replacement of its brake shoes, it is somewhat likely that the accumulation of brake shoe deposits had progressed in association with the duration of use of each brake shoe.

Example with no deposits
Brake shoe of wheel #1 of seventh vehicle
Brake shoe replacement date: January 30, 2014



Example of accumulated brake shoe deposits
Brake shoe of wheel #4 of seventh vehicle
Brake shoe replacement date: April 10, 2013

A heavy snow warning was issued in Kawasaki City at 16:44 on the 15th, and from the conditions of accumulated snow recorded at an inspection depot near the accident site, it is probable that from around 23:00 on the same day, the snow accumulated near the accident site was at a height where it would reach the top surface of the rails, and therefore it is somewhat likely that the wheel flange tops of the following train came into contact with the accumulated snow, and the snow was caught up in the flanges together with the oil remaining in the wheel flange components, mixing with the brake shoe deposits into a liquid state which was continuously supplied into the gap between the surface of the brake shoe lining and the treads of the wheels.

* Friction adjusting material and oil applied to rails: both of these are lubricants used at certain parts of the routes of individual railway operators served by the following train, to reduce lateral force and squeaking noises at curving sections and to prevent rail corrugation, but their composition, designations, and standards for use differ for each railway operator.

Probable causes: It is probable that the accident occurred as the train running on the track in the snow fall collided with the rear end of another train which stopped ahead, because the required brake force could not be obtained when the train driver applied an emergency brake to stop the train according to the instruction from the train dispatcher to manage the overrun at the station of another train which operated ahead of the accident train.

It is probable that the reasons why the required brake force could not be obtained in the approaching train, was the significant reduction of the coefficient of friction between the surface of the brake shoe lining and tread of the wheel, when the brake shoes of the air brake were pressed to the tread of wheels according to the operation of the emergency brake. It is somewhat likely that the reduction of the coefficient of friction was related with that the snow stacked in the track, the oils adhered to the wheel flange and the dusts adhered to the brake shoes were mixed in the liquid state and supplied into the gap between the wheel and the brake shoes.

For details, please refer to the investigation report. (Published on May 28, 2015)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2015-3-3.pdf

Derailment caused by the collapse of a cut slope, causing soil and sand to flow onto the tracks

Kyushu Railway Company; Train derailment accident between Satsuma Imaizumi station and Nukumi station, Ibusuki Makurazaki Line

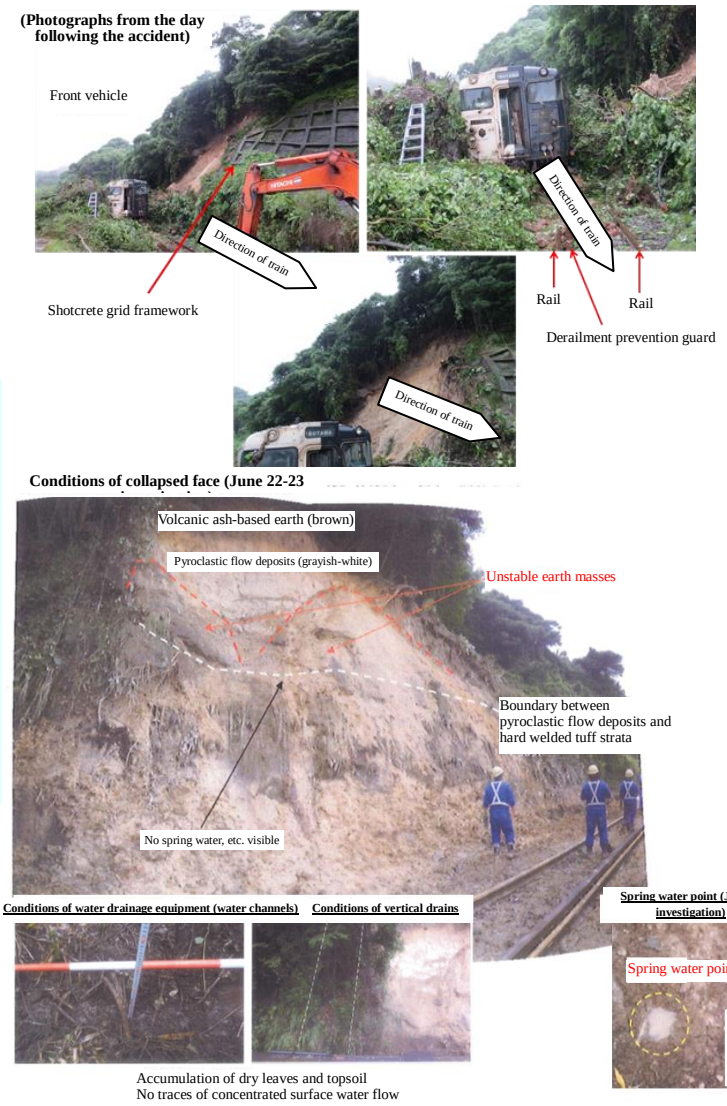
Summary: On June 21, 2014, the train, one-man operated and composed 2 vehicles, starting from Ibusuki station bound for Kagoshima Chuo station, Ibusuki Makurazaki Line of Kyushu Railway Company, passed Satsuma Imaizumi station on schedule. The driver of the train, running in powering operation at the velocity of about 50 km/h, noticed the trees disturbing the track about 60 m ahead, and immediately applied an emergency brake, but the train ran onto the trees and the earth and sand, and derailed.
It was found by the inspection implemented after derailed, that all 2 axles in the front bogie of the first vehicle were derailed to right. Here, the rear bogie of the first vehicle and all axles of the second vehicle were not derailed.
There were 44 passengers, the train driver, and two cabin crew members on board the train. Three passengers were seriously injured and 13 were slightly injured, and two cabin crew members were slightly injured.

Findings

On the day of the accident it had rained in Kagoshima Prefecture since the morning. The maximum rainfall per hour was 39 mm and the total amount of a continuous rainfall of the day was 100 mm. These values were small compared to those values observed when other large slope collapses occurred. Although it is probable that the rainfall was one factor contributing to the collapse of the slope, it is somewhat likely that factors other than the rainfall also had a significant impact.

The slope that collapsed had a steep gradient on its side face due to ridged topography, composed of strata consisting from the lowest layer of welded tuff, pyroclastic flow deposits, weathered pyroclastic flow deposits, loam, and solidified volcanic ash, and it is probable that the main area of the collapse consisted of pyroclastic flow deposit and weathered pyroclastic flow deposit strata. In addition, approximately 80 years had passed since the area surrounding the collapse was cut, and so it is probable that the stability of the slope was in nearly its limit level due to the deterioration of the dynamical firmness by age of the ground of the cut slope, and that this was a factor other than rainfall affecting the accident.

There were no problems with the management of the slope where the collapse occurred, with a standard general inspection performed on January 28, 2013, and no conditions applying to the slope that would make it a location requiring caution based on security plans, and since there was also no outflow of groundwater or clear traces indicating such outflow, it is probable that it was difficult to discover any signs pointing to the collapse of the slope.



Probable causes: It is highly probable that the accident occurred as the train collided with the trees and ran onto the trees and the earth and sand stacked on the track, and derailed because the trees and the earth and sand flew into the track from the cut slope in the left side of the track.
It is somewhat likely that the slope collapsed because of the increased weight of earth due to rain of the maximum hourly rainfall of 39 mm and the continuous precipitation of 100 mm, where the stability of the slope was in nearly its limit level due to the deterioration of the dynamical firmness by age of the ground of the cut slope, in addition to the topography and geological conditions of the collapsed slope.

For details, please refer to the investigation report. (Published on July 30, 2015)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2015-5-1.pdf

Derailment caused by large roll vibrations occurring in freight wagons

Japan Freight Railway Company; Train derailment accident between Kamaya station and Izumisawa station, Esashi Line

Summary: On September 11, 2012, the up line freight train, composed of 21 vehicles, departed from Goryokaku station, 62 minutes behind the scheduled time. As the train stopped by an emergency brake acted automatically at around the up line starting signal in Izumisawa station, the train driver got off the locomotive and check the situation of the train according to the instruction from the train dispatcher, and found that the coupler of the brake pipe hose between the 9th and the 10th vehicle, freight wagons, was decoupled and all two axles in the rear bogie of the 9th vehicle derailed to left.
There were the driver in charge and the other driver scheduled to operate the other train from Aomori signal station to Goryokaku station, but there was no casualty.

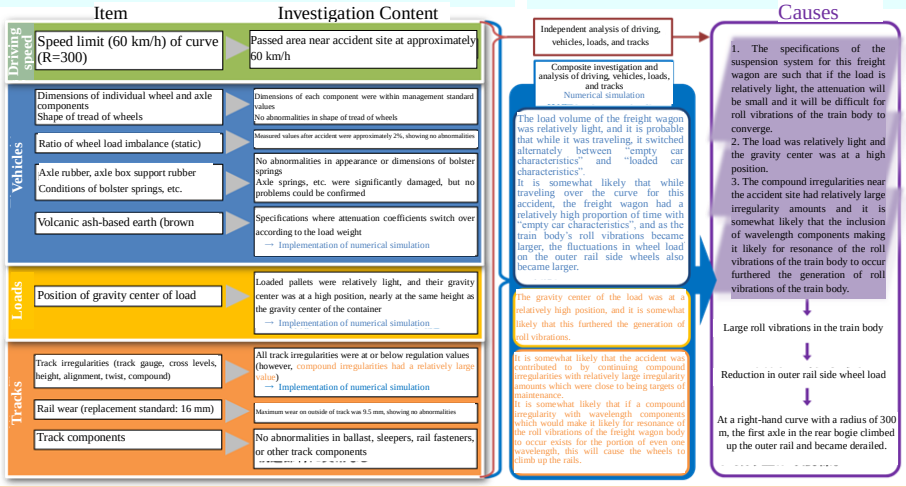
Findings

The derailed freight wagon (hereinafter referred to as "the freight wagon") was Ko-Ki 106 type, whose damping force of the suspention decrreases when this wagon is empty or light. it is probable that when the load is relatively light, it is difficult for roll vibrations of the train body to converge, and it is probable that as it was traveling, it alternated between its empty car characteristics and loaded car characteristics because the load volume of the freight wagon was relatively light at the time of the accident.
Also, it is somewhat likely that the height of the gravity center of the load, at a relatively high position near the center of the container, furthered the generation of roll vibrations of the freight wagon.

When the train was running under the speed limit near the accident site, it had a relatively high proportion of time with empty car characteristics, and as the train body's roll vibrations became larger, the fluctuations of wheel load on the outer rail side wheels also became larger, greatly contributing to the motion of the wheels to climb up the rails, and it is somewhat likely that when the Ko-Ki 106 type has relatively light load and the gravity center of its load is at a high position, it has a small margin with regard to derailment.

Although the track irregularities near the accident site were within the maintenance standard values, it is somewhat likely that the combination of alignment and cross-level being continuous irregularities with relatively large amounts which were close to maintenance targets, and the inclusion of wavelength components in the travel speed that would increase the roll vibrations of the train body, became causes of the accident, and that they were furthered by the repeated occurrence of roll vibrations of the train body and fluctuations in the wheel loads.

It is somewhat likely that the occurrence of derailment, even though the track irregularities near the accident site were within the maintenance standard values, was affected by combination of alignment and cross-level of track which existed in opposite phases, contributing to the motion of the wheels to climb up the rails. It is also somewhat likely that if a compound irregularity with wavelength components which would produce resonance of the roll vibrations of the freight wagon exists even one wavelength, roll vibration will occur and cause fluctuations in wheel loads, causing the wheels to climb up the rails.



Probable causes: It is probable that the accident occurred as the first axle in the rear bogie of the Ko-Ki 106 type freight wagon climbed up the outer rail and derailed, because the wheel load of the outer rail side wheel reduced at the accident site while the train passed the 300 m radius right curved track.
It is probable that the wheel load acting on the outer rail side wheel reduced by a large rolling vibration of the freight wagon running around the accident site.

For details, please refer to the investigation report. (Published on December 17, 2015)
http://www.mlit.go.jp/jtsb/railway/rep-acci/RA2015-9-2.pdf

There have been 3 accidents including this one on the Esashi Line with the common points of "While freight trains were traveling at speeds near the balancing speed on relatively sharp curves, the wheels of freight wagon climbed up the outer side rails and the wagons became derailed", and the JTSB has stated its opinions on countermeasures of these accidents to the Minister of Land, Infrastructure, Transportation, and Tourism.
For details, refer to "Chapter 1: Summary of Recommendations and Opinions Issued in 2015" (page 7).

Train was damaged and a fire occurred due to inability to sufficiently address part malfunctions

Hokkaido Railway Company; Serious incident (vehicle damage) in the premises of Yamasaki station, Hakodate Line

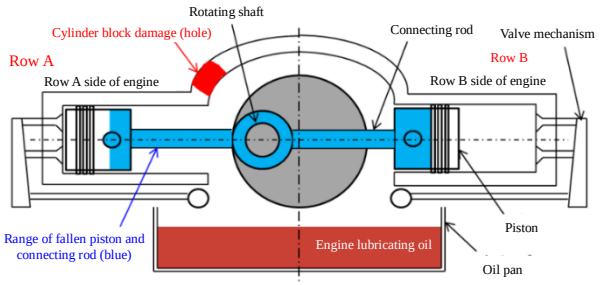
Summary: On July 6, 2013, the driver of the train, up line Limited Express composed of 8 vehicles, while operating in coasting at about 130 km/h in the premises of Yamasaki station, found that the engine indicator lamp was off, and stop the train. The driver checked the train and found the smoke emitted from under floor of the 4th vehicle, and found the fire above the engine. It was found that the upper part of the engine was damaged and the paint coated part of the body was partly burnt by the spattered combustible liquid that was considered to spatter from the damaged part of the engine.
There were about 200 passengers and four train crew members, i.e., the driver, the conductor and two cabin crew members, onboard the train, but no one was injured.

Findings

It is probable that the pin of the sliding block broke in the short term after the simultaneous renewal because the large bending load of about three times the designed maximum value of the manufacturer, acted continuously on the edge of the pin press fitted to the guide arm, and the stopper bolt was not installed in the engine. In addition to the undesirable behaviors in the fuel control device such as “not smooth motion”, which were the phenomena of the vibration of the piston or the instantaneous displacement of the piston to the direction to reduce the fuel injection rate, in the hydraulic servo motor when the notch of the master controller was shifted to the particular position.

It is probable that the reason why the engine was damaged by the over speed operation were related with that the control rack was designed to act to increase fuel injection rate when the pin of the sliding block was damaged, and that there was no mechanism to stop the engine operating in over speed, forcibly.

It is somewhat likely that the backgrounds of occurrence of the serious incident were that the measures were planned by the limited staffs in charge without investigation by the whole company against the frequent damages of the parts related with the sliding block and the fuel control which effected the vehicle etc., seriously, furthermore, these measures were the symptomatic therapy instead of the measures decided by the analyses and investigation based on the data obtained by the sufficient inspection.




Left side of 4th vehicle (around area from engine to radiator)


Left side of 4th vehicle (around area from radiator to rear bogie)


Left side of 4th vehicle (around area from rear bogie to 5th vehicle)

Probable causes (Excerpt): It is highly probable that the incident occurred by the following process.

[1] As the pin press fitted into the guide arm of the sliding block, used as the speed governor for the diesel engine installed in the 4th vehicle of the express train, broke by metal fatigue at the edge of press fitted part, then the engine became uncontrollable and over speed operation caused damages of the piston and connecting rod etc., equipped inside of the engine.

[2] The fuel and the lubricating oils for the engine and antifreeze corrosion inhibitor included in the coolant of the engine spouted from the bored holes caught a fire by the spark generated by the broken connecting rod stabbed and destroyed the cylinder block, and these oils etc., stacked on the high temperature surfaces of the exhaust manifold, the turbo charger, the exhaust pipe, etc., and combusted.

[3] As the train ran in high speed at that time, the above mentioned fuel and engine lubrication oil etc., scattered to the rear vehicles of the train and stacked on the side surface of the vehicle body, then the paint on the surface of the vehicle body burned.

For details, please refer to the serious incident investigation report. (Published on April 23, 2015)
http://www.mlit.go.jp/jtsb/railway/rep-inci/RI2015-1-1.pdf

Chapter 5 Marine accident and incident investigations

1 Marine accidents and incidents to be investigated

<Marine accidents to be investigated>

◎Paragraph 5, Article 2 of the Act for Establishment of the Japan Transport Safety Board

(Definition of marine accident)

The term "Marine Accident" as used in this Act shall mean as follows:

1 Damage to a ship or facilities other than a ship related to the operations of a ship.

2 Death or injury of the people concerned with the construction, equipment or operation of a ship.

<Marine incidents to be investigated>

◎Item 2, paragraph 6, Article 2 of the Act for Establishment of the Japan Transport Safety Board (Definition of marine incident)

A situation, prescribed by Ordinance of Ministry of Land, Infrastructure, Transport and Tourism, where deemed to bear a risk of Marine Accident occurring.

◎Article 3 of Ordinance for Enforcement of the Act for Establishment of the Japan Transport Safety Board

(A situation, prescribed by Ordinance of the Ministry of Land, Infrastructure, Transport and Tourism, stipulated in item 2, paragraph 6, Article 2 of the Act for Establishment of the Japan Transport Safety Board)

1 The situation wherein a ship became a loss of control due to any of the following reasons:

(a) navigational equipment failure;

(b) listing of a ship; or

(c) short of fuel or fresh water required for engine operation.

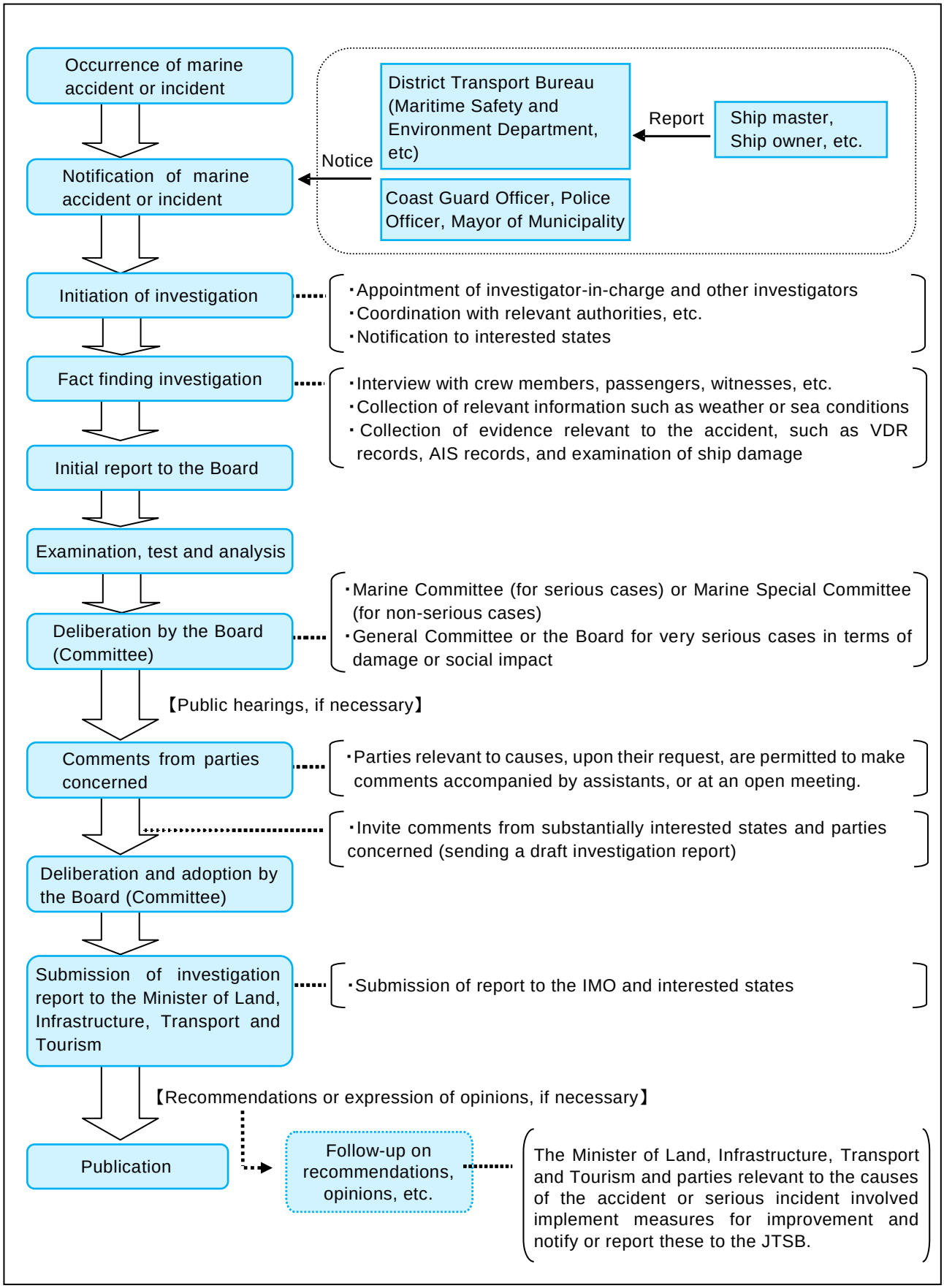
2 The situation where a ship grounded without any damage to the hull; and

3 In addition to what is provided for in the preceding two items, the situation where safety or navigation of a ship was obstructed.

<Category of marine accident and incident>

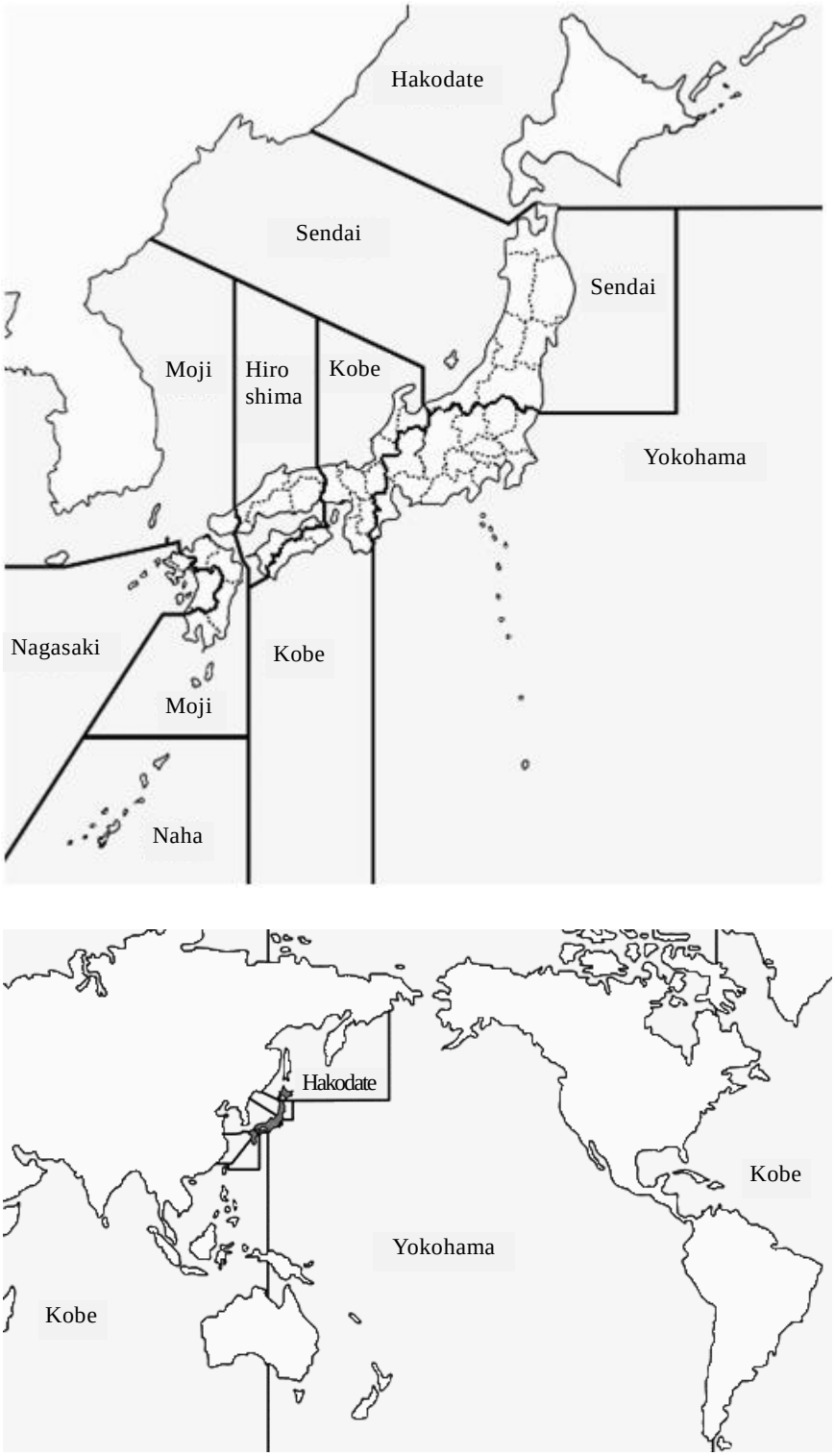
Marine accident and incident to be investigated		Type of marine accident and incident
Marine accident	Damage to ships or other facilities involved in ship operation	Collision, Grounding, Sinking, Flooding, Capsizing, Fire, Explosion, Missing, Damage to facilities
	Casualty related to ship structures, equipment or operations	Death, Death and injury, Missing person, Injury
Marine incident	Navigational equipment failure	Loss of control (engine failure, propeller failure, rudder failure)
	Listing of ship	Loss of control (extraordinary listing)
	Short of fuel or fresh water required for engine operation	Loss of control (fuel shortage, fresh water shortage)
	Grounding without hull damage	Stranded
	Obstruction of ship safety or navigation	Safety obstruction, Navigation obstruction

2 Procedure of marine accident/incident investigation



3 Jurisdiction of the Offices over marine accidents and incidents

For the investigation of marine accidents and incidents regional investigators are stationed in the regional offices (eight offices). Our jurisdiction covers marine accidents and incidents in the waters around the world, including rivers and lakes in Japan. The regional offices are in charge of investigations in the respective areas shown in the following map. Marine accident investigators in the Tokyo Office (Headquarters) are in charge of serious marine accidents and incidents.



Jurisdiction map

4 Role of the Offices and Committees according to category of accident and incident

Serious marine accidents and incidents are investigated by the marine accident investigators in the Headquarters, and are deliberated in the Marine Committee. However, particularly serious accidents are deliberated in the General Committee, and extremely serious accidents are deliberated in the Board.

Non-serious marine accidents and incidents are investigated by regional investigators stationed in the eight regional offices, and deliberated in the Marine Special Committee.

(For the deliberation items of the Board and each Committee, refer to page 2 of the Appendixes)

<table>
<tr><td>Serious marine accidents and incidents</td><td>Office in charge of investigation: Marine accident investigators in the Headquarters
Committee in charge of deliberation and adoption: Marine Committee</td></tr>
<tr><td colspan="2">Definition of ”serious marine accidents and incidents”
•Cases where a passenger died or went missing, or two or more passengers were severely injured.
•Cases where five or more persons died or went missing.
•Cases involved a vessel engaged on international voyages where the vessel was a total loss, or a person on the vessel died or went missing.
•Cases of spills of oil or other substances where the environment was severely damaged.
•Cases where unprecedented damage occurred following a marine accident or incident.
•Cases which made a significant social impact.
•Cases where identification of the causes is expected to be significantly difficult.
•Cases where essential lessons for the mitigation of damage are expected to be learned.</td></tr>
<tr><td>Non-serious marine accidents and incidents</td><td>Office in charge of investigation: Regional investigators in the regional offices
Committee in charge of deliberation and adoption: Marine Special Committee</td></tr>
</table>

5 Statistics of investigations of marine accidents and incidents (As of end of February 2016)

The JTSB carried out investigations of marine accidents and incidents in 2015 as follows:

Investigations into 688 accidents had been carried over from 2014, and 793 accident investigations newly launched in 2015. Investigation reports on 862 accidents were published, and thereby 613 accident investigations were carried over to 2016.

Investigations into 87 incidents had been carried over from 2014, and 106 incident investigations newly launched in 2015. Investigation reports on 126 incidents were published, and thereby 66 incident investigations were carried over to 2016.

Investigations of marine accidents and incidents in 2015

(Cases)

Category	Carried over from 2014	Launched in 2015	Not applicable	Transferred to Tokyo Office	Total	Publication of investigation report	(Recommendations)	(Safety recommendations)	(Opinions)	Carried over to 2016	(Interim report)
Marine accident	688	793	△6	0	1,475	862	(0)	(0)	(0)	613	(0)
Tokyo Office (Serious cases)	24	8	△1	2	33	18				15	
Regional Offices (Non-serious cases)	662	785	△5	△2	1,442	844				598	
Marine incident	87	106	△1	0	192	126	(0)	(0)	(0)	66	(0)
Tokyo Office (Serious cases)	0	0	0	0	0	0				0	
Regional Offices (Non-serious cases)	87	106	△1	0	192	126				66	
Total	775	899	△7	0	1,667	988	(0)	(0)	(0)	679	(0)

Note 1. The figures for “Launched in 2015” includes cases which occurred in 2014 or earlier, and which the JTSB was notified of in 2015 as subjects of investigation.

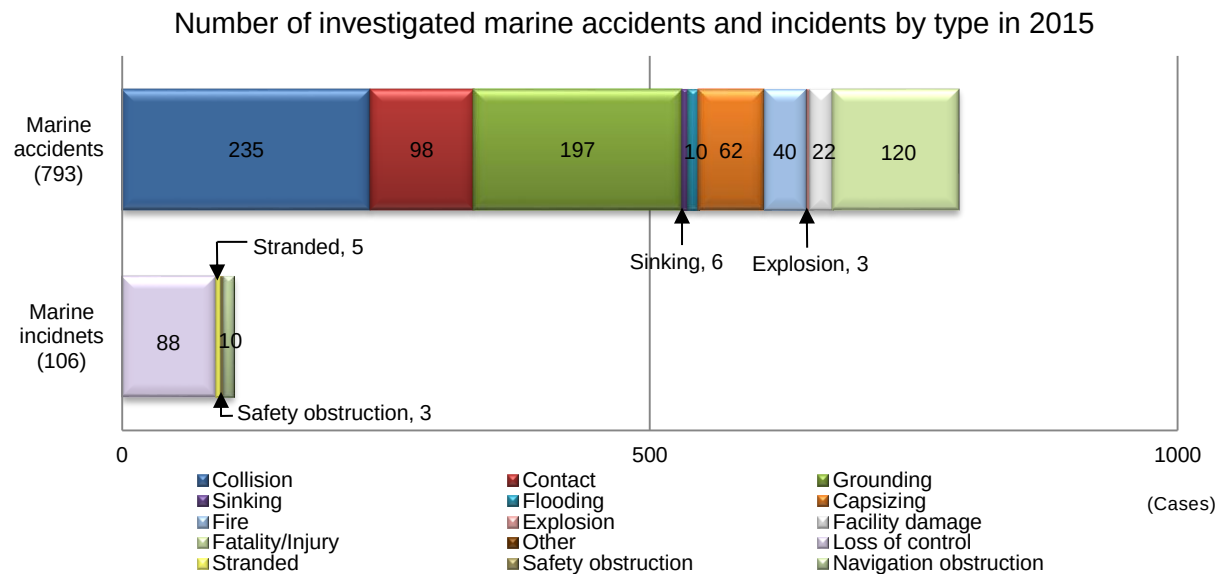
Note 2: The column “Not applicable” shows the number of cases which did not come under the category of accident or incident as defined in Article 2 of the Act for Establishment of the Japan Transport Safety Board.

Note 3: The column “Transferred to Tokyo Office” shows the number of cases where the investigation found out that it was serious and the jurisdiction was transferred from the regional office to the Tokyo Office.

6 Statistics of investigations launched in 2015 (As of end of February 2016)

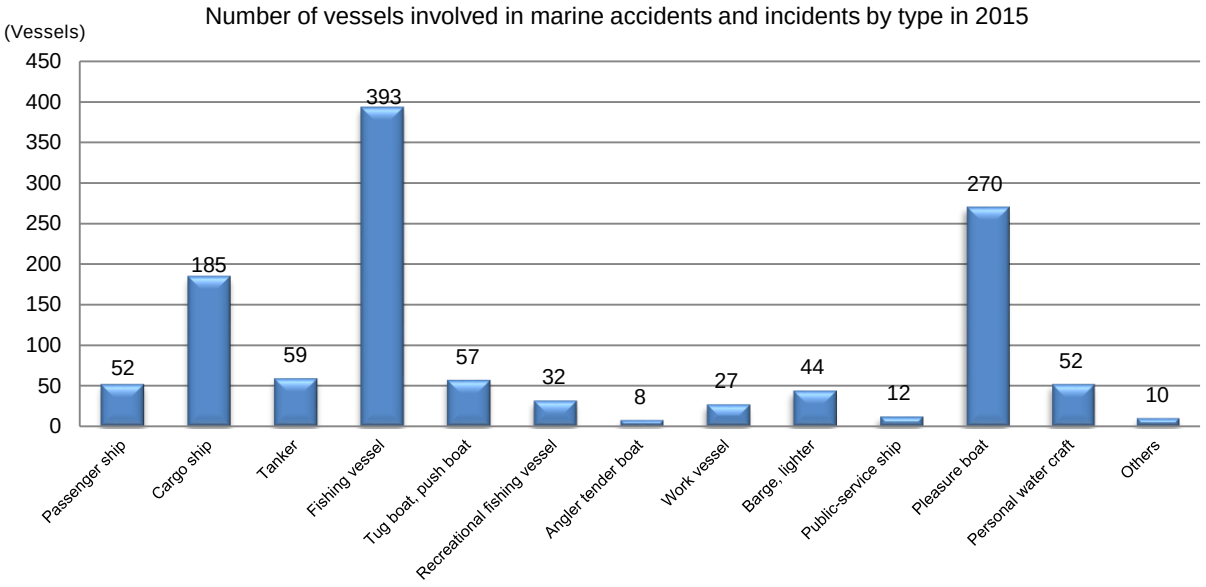
(1) Types of accidents and incidents

The 899 investigations launched in 2015 are classified by types as follows: With regard to marine accidents, there were 235 cases of collision, 197 cases of grounding, 120 cases of fatality/injury (not involved in other types of accidents), and 98 cases of contact. With regard to marine incidents, there were 88 cases of loss of control, 10 cases of navigation obstruction, and five cases of stranded. The objects of contact were quays in 24 cases, breakwaters in 21 cases, and light beacon in nine cases.



(2) Types of vessels

The number of vessels involved in marine accidents and incidents is 1,201. Those vessels are classified by type as follows: 393 fishing vessels, 270 pleasure boats, 185 cargo ships, 59 tankers, and 57 tug boat, push boats.



The number of foreign-registered vessels involved in marine accidents and incidents was 86, and they were classified by accident type as follows: 47 vessels in collision, 16 vessels in grounding, and 11 vessels in contact. As for the flag of vessels, 19 vessels were registered in Panama, 17 vessels in South Korea, 12 vessels in Cambodia, seven vessels in Hong Kong. The number of vessels registered in Asian countries or regions was accounting for a half of the accidents and incidents.

Number of foreign-registered vessels by flag

(Vessels)

Panama	19	Viet Nam	4	Sierra Leone	2
South Korea	17	Bahamas	4	Belize	2
Cambodia	12	Liberia	4	Malta	2
Hong Kong	7	Singapore	3	Others	10

(3) Number of casualties

The number of casualties was 395, consisting of 80 deaths, 15 missing persons, and 300 injured persons. By type of vessel, 130 persons in pleasure boats and 123 persons in fishing vessels. By type of accident, 143 persons in casualties, 114 persons in collision, 54 persons in contact, 45 persons in capsizing, and 22 persons in grounding.

With regard to persons dead or missing, 51 persons were involved in fishing vessel accidents, 24 persons in pleasure-boat accidents, indicating dead or missing cases occurred frequently in fishing vessels.

Number of casualties (marine accident)

(Persons)

2015										
Vessel type	Dead			Missing			Injured			Total
	Crew	Passengers	Others	Crew	Passengers	Others	Crew	Passengers	Others	
Passenger ship	2	1	0	0	1	0	3	19	3	29
Cargo ship	5	0	0	0	0	0	8	0	0	13
Tanker	0	0	0	0	0	0	4	0	0	4
Fishing vessel	41	0	0	10	0	0	71	0	1	123
Tug boat, push boat	3	0	0	1	0	0	5	0	0	9
Recreational fishing vessel	0	2	0	0	0	0	2	13	0	17
Angler tender boat	0	0	0	0	0	0	0	5	0	5
Work vessel	0	0	1	0	0	0	2	0	1	4
Barge, lighter	0	0	0	0	0	0	0	0	0	0
Public-service ship	1	0	0	0	0	0	5	0	3	9
Pleasure boat	12	0	10	2	0	0	32	0	74	130
Personal water craft	0	0	2	0	0	1	16	0	31	50
Others	1	0	0	0	0	0	2	0	0	2
Total	64	3	13	13	1	1	150	37	113	395
	80			15			300			

7 Summaries of serious marine accidents and incidents which occurred in 2015

The serious marine accidents which occurred in 2015 are summarized as follows: The summaries are based on information available at the initial stage of the investigations and therefore, may change depending on the course of investigations and deliberations.

(Marine accident)

1	Date and location of accident	Vessel type and name, accident type
	March 27, 2015 Near the area 1.5 km to the east of Sumiyoshi Fishing Port, Hakodate City, Hokkaido	Tug boat MEIYU No. 18 (Ship A) Towed barge SK-106 (Ship B) Capsize
	Summary	Ship A, with four crew members onboard, and Ship B, which was being towed, capsized. Two of the crew members of Ship A died, and one crew member went missing.
2	Date and location of accident	Vessel type and name, accident type
	April 12, 2015 In Oge Port, Oge Island, Imabari City, Ehime Prefecture	Passenger ship FUNADA Fire
	Summary	The ship caught fire in Oge Port, Oge Island, Imabari City, and foundered. One of the passengers died, and one went missing.
3	Date and location of accident	Vessel type and name, accident type
	July 31, 2015 Near the area about 55 km off the coast of Tomakomai, Hokkaido	Passenger ferry SUNFLOWER DAISETSU Fire
	Summary	While the ship was sailing from the Port of Oarai in Ibaraki Prefecture to the Port of Tomakomai, a fire broke out in the vehicle deck, near the area about 55 km off the coast of Tomakomai. One crew member died.
4	Date and location of accident	Vessel type and name, accident type
	August 4, 2015 Off the southwestern tip of Azuchi-Oshima Island, Hirato City, Nagasaki Prefecture	Fishing vessel EBISUMARU No. 6 Fatality of fishing passenger
	Summary	The ship, with the skipper on board, boarded two fishing passengers, and while it was anchored for fishing off the southwestern tip of Azuchi-Oshima Island, one fishing passenger fell into the water and died.
5	Date and location of accident	Vessel type and name, accident type
	H27.10.14 October 14, 2015 No.5 Wharf in Soma Port, Soma City, Fukushima Prefecture	Cargo Ship ASIAN INFINITY (Panama) Fatal accident involving a crew member
	Summary	The crew menber fell down to a cargo hold and died when cleaning the cargo hold after discharging cargo while the ship was at berth alongside No.5 Wharf in Soma Port, Soma City, Fukushima Prefecture.
6	Date and location of accident	Vessel type and name, accident type
	H27.10.17 October 17, 2015 Off the east of Mutsure-jima Island, Shimonoseki City, Yamaguchi Prefecture	Chemical Tanker SULPHUR GARLAND (Ship A, Panama) Oil Tanker WAKO MARU NO. 2 (Ship B) Collision
	Summary	Ship A and Ship B collided with each other off the east of Mutsure-jima Island, Shimonoseki City, Yamaguchi Prefecture. Consequently, some oil spilled from Ship B into the sea.
7	Date and location of accident	Vessel type and name, accident type
	H27.10.19 October 19, 2015 Higashinada Tomen Silo Quay, Higashinada Ward, Kobe City, Hyogo Prefecture	Cargo Ship TRITON SWAN (Panama) Fatal accident involving a person concerned with cargo operation
	Summary	While the ship was moored at the above quay, the person concerned with cargo operation was found collapsed in a cargo hold by another person concerned with cargo operation. He was recovered from the hold by a fire and rescue team, but was confirmed dead.
8	Date and location of accident	Vessel type and name, accident type
	October 24, 2015 Off the coast of Yamada Bay, Iwate Prefecture	Fishing vessel KAISHUMARU Fatality of fishing passenger

	Summary	Immediately after beginning fishing off the coast of Yamada Bay, Iwate Prefecture, a fishing passenger who could not be located on board was discovered floating on the water face-down and was pulled back on board, but was confirmed to be dead.

(Marine incident)

No marine incident occurred in 2015.

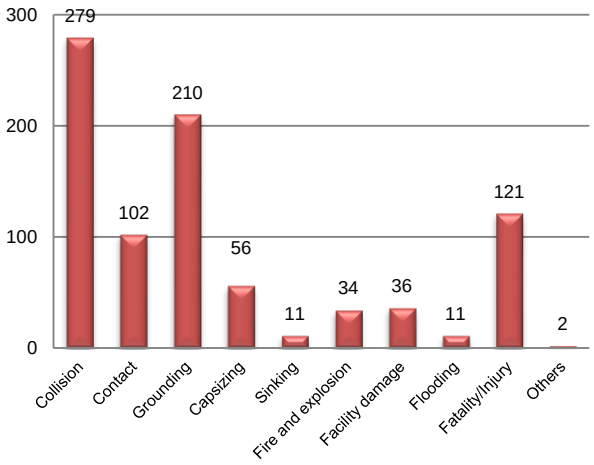
8 Publication of investigation reports

The number of investigation reports of marine accidents and incidents published in 2015 was 988 composed of 862 marine accidents (among them, 18 were serious) and 126 marine incidents.

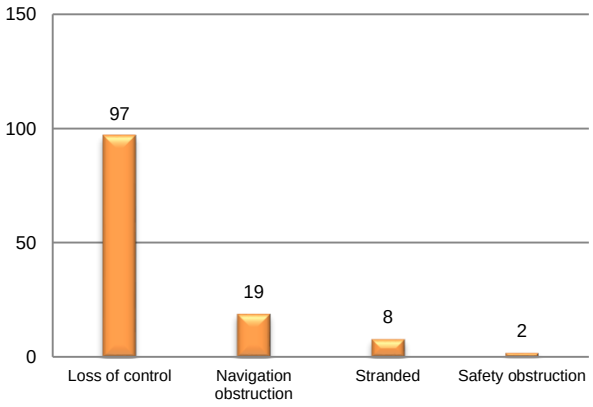
Looking those accidents and incidents by type, there were 279 cases of collision, 210 cases of grounding, 121 cases of fatality/injury, and 102 cases of contact in marine accidents. Whereas in marine incidents, there were 97 cases of losses of control, (including 95 cases of navigational equipment failure and two cases of out-of-fuel), 19 cases of navigation obstruction, and eight cases of stranded.

As for the objects of contact, 25 were breakwaters, 19 were quays, and seven were light buoys.

Marine accidents (862 cases): reports publicized in 2015



Marine incidents (126 cases): reports publicized in 2015



The number of vessels involved in marine accidents and incidents was 1,354. Looking at those vessels by type, the vessels involved in marine accidents were 394 fishing vessels, 216 cargo ships, 215 pleasure boats, and 69 tug boats and push boats. The vessels involved in marine incidents were 49 fishing vessels, 32 pleasure boats, 18 cargo ships, and 15 passenger ships.

Number of vessels by type involved in marine accidents and incidents for which reports were publicized in 2015

(Vessels)

Classification	Passenger ship	Cargo ship	Tanker	Fishing vessel	Tug boat, push boat	Recreational fishing vessel	Angler tender boat	Work vessel	Barge, lighter	Public-service ship	Pleasure boat	Personal water craft	Others	Total
Marine accident	47	216	64	394	69	39	7	34	50	14	215	58	19	1,226
Marine incident	15	18	6	49	3	0	0	1	2	1	32	1	0	128
Total	62	234	70	443	72	39	7	35	52	15	247	59	19	1,354
%	4.6	17.3	5.2	32.7	5.3	2.9	0.5	2.6	3.8	1.1	18.2	4.4	1.4	100.0

The published investigation reports on serious marine accidents and incidents in 2015 can be found on JTSB website at:

http://www.mlit.go.jp/jtsb/marrep.html

9 Actions taken in response to recommendations in 2015

There were no actions taken in response to recommendations in 2015.

10 Provision of factual information in 2015

There were no cases of provision of factual information in 2015.

Column

Environmental Regulations and the IoT

Marine Accident Investigator

Currently, there is great attention being placed on new environmental regulations and technological trends which could conceivably affect marine accident investigations in the future.

The management of ballast water is the subject of one such new environmental regulation, with International Maritime Organization (IMO) treaties related to it nearing the completion of the conditions for its enactment. The objective of this regulation is to prevent ecosystems from being impacted when microorganisms in ballast water for ships are released into marine areas where they do not normally live, and then propagate in those waters. Personally, I enjoy eating hard-shell clams, but generally such introduced species are very troublesome. Under this regulation, for the time being it will be necessary for ships to replace their ballast water offshore before entering ports, and in the future to be equipped with ballast water treatment equipment. Any errors in the replacement procedures for ballast water could cause ship hulls to list, and though most treatment equipment uses filters and ultraviolet (UV) light, some types use chemical agents, and so safe operation of such equipment will be a necessity.

Another environmental regulation specifies the use of fuel with low sulfur content. This regulation is intended to prevent the destruction of forests due to acid rain caused by sulfur oxide in the air. Fuel with low sulfur content has a lower viscosity than C heavy oil, and since it is more watery, it affects the conditions of wear and degradation of pumps equipped with engines and their parts. Measures such as cooling the fuel in advance in order to raise its viscosity are being taken to address this, but even still, the number of accidents involving power failure occurring off the coast of California as noted in Lloyd's List has been increasing since 1 to 2 years ago. Also, the number of ships using LNG for their fuel, as a type of new fuel that does not include sulfur, has been rising. The "International Code of Safety for Ships using Gases or other Low-flashpoint Fuels" (IGF code) has been created to indicate safety requirements such as the distance required between external hull plating and LNG fuel tanks, and is scheduled to become mandatory, but there will be a need in the future to prepare responses to address unforeseen risks as well.

As a form of new technology, the IoT (Internet of Things) for ships has also become the subject of much recent attention. Currently, information is gathered on ships using voyage data recorders (VDRs) or engine data loggers. Such information is transmitted to land-based destinations using high-capacity satellite telecommunications, and shipping agents or other parties on land use the Internet to acquire and analyze the information, introducing services such as giving advice on ship speed or navigation plans with consideration for fuel efficiency, detecting abnormal engine conditions, and providing recommendations on maintenance content. Conventionally, investigators have been given training on procedures to obtain objective data from VDRs or other equipment that required learning methods of identifying data that were different for each manufacturer, and when accidents occurred, they would board ships to extract the data before the accumulated information was overwritten. The advancement of IoT technology could possibly lead to the ability in the future to collect data from land without having to wait for ships to enter ports.

Although environmental protection measures such as these are undoubtedly important, it will also be necessary to consider new environmental regulations as background elements in marine accidents, to minimize any safety-related issues that could be their by-products, and to utilize information obtained from new technology in accident investigations. As a marine accident investigator, I would like to continue to conduct flexible investigations while gaining a first-hand understanding of the trends occurring in regulations and technology.

11 Summaries of major marine accident investigation reports (Case studies)

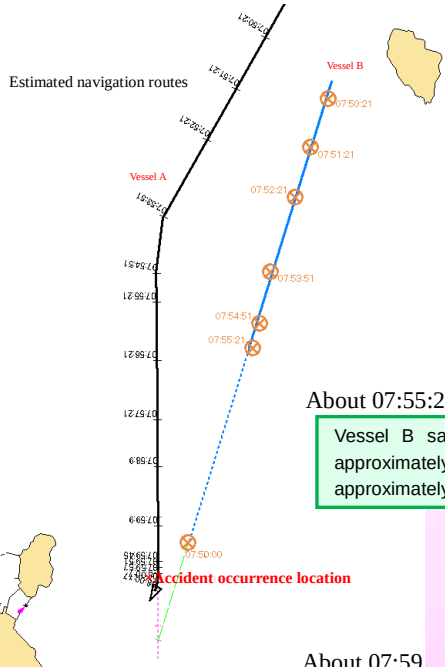
Collision of large Self-Defense Force ship with small pleasure boat, resulting in two fatalities

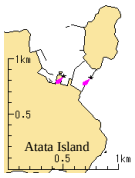
Collision between tank landing ship OSUMI and pleasure boat TOBIUO

Summary: The OSUMI (Vessel A, standard displacement of 8,900 tons), with the master, chief navigator, and 120 crew members onboard, was proceeding southward from Kure Port, Kure City in Hiroshima Prefecture toward Tamano City in Okayama Prefecture. The TOBIUO (Vessel B, length: 7.60 m), with the skipper and three acquaintances of skipper onboard, was proceeding south-south-west from Hiroshima City, Hiroshima Prefecture, toward the coast of Kabuto Island, located south of Atata Island, Otake City, Hiroshima Prefecture. The two ships collided off the eastern coast of Atata Island.

For Ship B, the skipper and one passenger died, and one other passenger sustained injuries. In addition, there were abrasions and other damage to the starboard side of the ship, and the ship capsized.

For Ship A, there were abrasions extending from the center part of the port side to the stern, but there were no fatalities.





About 07:54

Vessel A veered to 180° and sailed at a speed of approximately 17 kn.

About 07:55:21 – 58:40

Vessel A sailed while maintaining its course and speed.

07:58:40 – 48sec

The chief navigator gave orders to lower the speed one level to proceed all ahead at high speed.

07:59:13

The skipper gave orders to lower the speed one level further, to proceed all ahead at normal speed.

About 07:59:37

The skipper gave orders to proceed all ahead at slow speed.

07:59:40 – 43sec

The skipper gave orders to stop both propellers, sound an alarm signal, and put the rudder hard to starboard.

About 07:59:51

Vessel A began to reduce its speed and turn to starboard, but approached further.

About 07:55:21 – 59min

Vessel B sailed with an average course of approximately 197° and an average speed of approximately 16.4 kn.

About 07:59

Vessel B gradually changed course to starboard

About 07:59:46 – 55sec

Vessel B made preparations to head for Atata Fishing Port and approached Vessel A.

After 07:59:55

Vessel B approached to within 15 m of the side of Vessel A's port bow, and reduced speed or stopped, but approached further.

Collision (about 08:00)

Probable causes: It is probable that this accident occurred because off the eastern coast of Atata Island, when Vessel A was proceeding south and Vessel B was proceeding south-southwest, Vessel A sailed while maintaining its course and speed, and Vessel B changed course to starboard from ahead of the port side of Vessel A, approaching close to the bow of Vessel A, and when Vessel A attempted to avoid it by reducing its speed and turning to starboard, both ships approached even closer to each other and collided.

For details, please refer to the investigation report. (Published on February 9, 2015)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2015/MA2015-2-1_2014tk0001.pdf

Collision in no-passing zone in the area near the Kurushima Strait Traffic Route Naka Suido south entrance

Collision between passenger ferry Ferry Fukuoka 2 and cargo ship RYOFU

Summary: A passenger ferry, Ferry Fukuoka 2 (Vessel A, gross tonnage: 9,788 tons), with a master, 23 crew members and 427 passengers onboard, and a cargo ship RYOFU (Vessel B, gross tonnage: 4,464 tons), with a master and 13 crew members onboard, collided in the vicinity of the Naka Suido south entrance at around 0253 on January 12, 2013, while sailing northwest in the Kurushima Strait Traffic Route.

vessel A had dents and scratches on the aft part of the starboard shell plate and vessel B had scratches on the port side fore, but there were no fatalities or injuries on both vessels.

Watchkeeping Arrangement
- Master: Conn
- Chief Officer: Conn assistance
- Able/ordinary seaman: Lookout
- Able/ordinary seaman: Helmsman
- Chief Engineer: Engine operation

Watchkeeping Arrangement
- Chief Officer: Tasks other than helm (lookout, steering order, speed adjustment, communication on VHF, etc.)
- Able seaman: Helm

At around 0242
It is considered highly probable that the vessel A, after overtaking the vessel B, entered the Kurushima Strait Traffic Route at a speed of approximately 12.5 kn and sailed toward the Naka Suido.

At around 0244
The master confirmed by radar that the Vessel B behind it was heading for the area near the Naka Suido south entrance and was increasing its speed.

At around 0246
The vessel A made a starboard turn along the Kurushima Strait Traffic Route.

At around 0248
The master monitored an instruction from Kurushima MARTIS to Vessel B, instructing it not to overtake Vessel A (to sail while maintaining its speed)

At around 0251
The vessel A started to turn to starboard toward the Naka Suido south entrance.

At around 0252
The master took a starboard turn in order to make a stern kick to avoid collision.

At around 0242
The vessel B started to turn to starboard after the vessel A overtook the vessel B.

At around 0243
The vessel B entered the Kurushima Strait Traffic Route at a speed of approximately 13 kn, sailed northwest toward the Naka Suido south entrance.

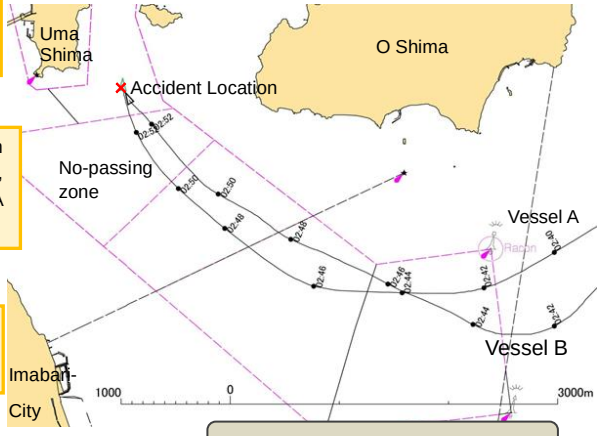
At around 0244
Then gradually increased the speed.

At around 0248
Vessel B received instructions from Kurushima MARTIS that it would soon be entering a no-passing zone, to reduce speed and follow Vessel A, and that it must not overtake Vessel A, but it did not carry out suitable operations to reduce speed and after this it continued to approach Vessel A.

At around 0250
When the distance to the vessel A was approximately 300 m, the vessel B took 10° to starboard and started to turn to starboard.

At around 0252
Vessel B put the rudder hard to starboard.

Navigation Tracks of the Vessels



Tide: Middle of falling tide
North-going current of approximately 8 kn

Collision *At around 0253*

Probable Causes: It is considered probable that this accident occurred because, as the speed reduction of the officer B of the vessel B was inadequate, the vessel B continued to approach the vessel A and the vessels collided while both the vessel A and the vessel B were sailing northwest in the no-passing zone in the vicinity of the Naka Suido south entrance in the Kurushima Strait Traffic Route at night.

It is considered somewhat likely that speed reduction by the officer B was inadequate, because the officer B had to carry out all the tasks other than helming without help as the watchkeeping arrangement of the vessel B for safe navigation, such as master's attendance on the bridge and conning the vessel was not ensured during the passage through the Kurushima Strait Traffic Route which is narrow and congested with vessels.

For details, please refer to the investigation report. (Published on July 30, 2015)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2015/MA2015-8-1_2014tk0016.pdf

Grounding without recognizing navigation toward shallow areas, while avoiding groups of fishing vessels

Grounding of passenger ferry OCEAN EAST

Summary: The vessel (gross tonnage: 11,523 tons) had a skipper, an able seaman, and 19 other crew members on board. It boarded 43 passengers, and while proceeding east from Tokushima-Komatsushima Port, Tokushima Prefecture, to Keihin Port Tokyo-ku, it ran aground at about 12:05 on July 18, 2014, at Okinose off the east of Tokushima-Komatsushima Port.

Although the vessel suffered damage consisting of a hole and buckling damage at the bottom of its starboard side, as well as water damage to the passenger cars loaded onto it, there were no casualties.

About 11:40

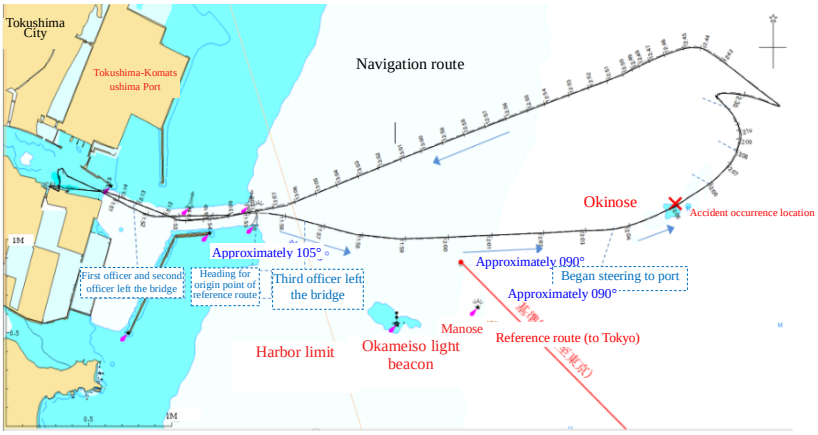
The vessel left the Tokushima-Komatsushima Port ferry berth.
(Draft: bow - approximately 5.75 m, stern - approximately 6.45 m)

About 11:55

It began to increase speed and assumed a course of approximately 105°.

About 11:56

The third officer from among the duty officers was ordered to leave the bridge, and after this no officers or lookouts were assigned.



About 11:58

The skipper confirmed 3 batch groups in the path ahead, and attempted to sail between the 2nd and 3rd batch groups.

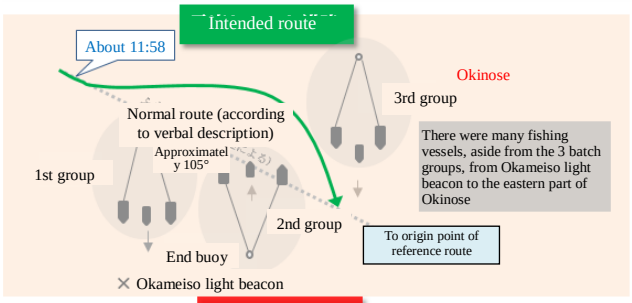
About 11:59

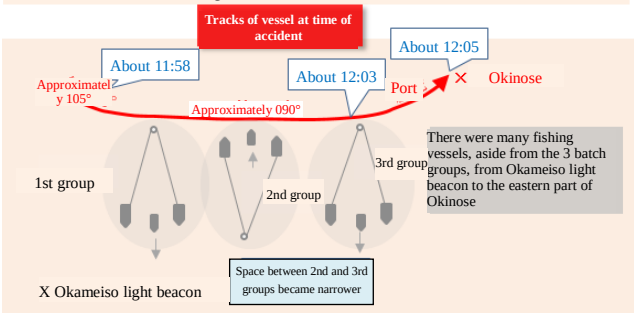
It assumed a course of approximately 090° to pass behind the 1st batch group, and after this, the space between the 2nd and 3rd batch groups narrowed, so the skipper abandoned the course of sailing between them.

About 12:03

The skipper intended to avoid the 3rd batch group, ordering the able seaman to put the rudder 7° to port. He then focused his attention on confirming the movement of the groups of fishing boats using binoculars, and had not confirmed the vessel's position.

Grounding (about 12:05)





Probable causes: It is probable that this accident occurred because in the area off the east of Tokushima-Komatsushima Port, while proceeding east among approximately 100 fishing and other vessels, when the vessel turned to port to avoid the 3rd of the "groups of 3 vessels, each including 2 fishing vessels using trawl nets to catch young sardines" ("batches") on the path ahead, the skipper was not confirming the vessel's position, failing to realize that it was sailing toward Okinose and resulting in the ship grounding at Okinose.

It is probable that the reason the vessel's position was not confirmed was that the vessel's skipper was focusing his attention on confirming the buoy marking the end of the 3rd batch's net and the movement of the fishing vessels in the surrounding area.

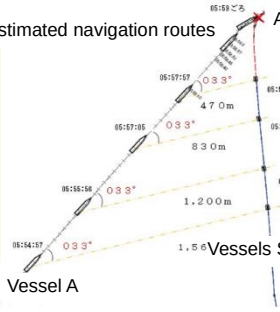
It is possible that the situation where, in waters congested with other vessels, the skipper of the vessel ordered the third officer from among the duty officers to leave the bridge, leaving the skipper to conn the vessel, keep a lookout, and perform other tasks by himself, contributed to the occurrence of this accident.

For details, please refer to the investigation report. (Published on September 17, 2015)
http://www.mlit.go.jp/jtsb/ship/rep-acci/2015/MA2015-10-1_2014tk0013.pdf

Collision of a container ship which had a pilot on board, with two fishing vessels forming a group alongside each other

Collision of container ship WAN HAI 162 with fishing vessels SEINAN MARU No.7 and SEINAN MARU No.8

Summary: The WAN HAI 162 (Vessel A, gross tonnage: 13,246 tons), with a master and twenty other crews onboard, sailing northeast toward the Osaka section of Hanshin Port under the pilotage of a pilot, and the fishing vessels SEINAN MARU No.7 (Vessel B, gross tonnage: 9.7 tons) and SEINAN MARU No.8 (Vessel C, gross tonnage: 9.7 tons), both with a master and one other crew onboard, tied together by wire ropes at bow and middle of the hull, starboard side of Vessel B alongside of the port side of Vessel C, sailing north toward fishing grounds, collided each other(Vessels S) at about 05:59 on February 25, 2013, off the coast to the west of Kansai International Airport.
The master of Vessel B was killed and the vessel had a hole in the stern part of the vessel. Crew of Vessel C was killed and the stern part of the vessel was torn apart.
The Vessel A suffered scratches on the fore part of the vessel, but no one was injured.



(Image)

At about 05:55

The pilot visually confirmed 5 or 6 fishing vessels, including the Vessels S, proceeding north in the direction of the starboard bow.

At about 05:56 to 05:57,

Master noticed Vessels S heading directly toward the bow of Vessel A, and told Pilot A to exercise caution and take action to avoid a collision because Vessels S were cutting across the path of Vessel A.

The pilot thought that changing course or speed would bring Vessel A close to the surrounding fishing vessels, and was unable to decide on a way of avoiding a collision with Vessels S, and sailed while maintaining the vessel's course and speed.

At about 05:58:44

Pilot directed Ordinary Seaman to turn hard to starboard.

At about 05:58:51

Vessel A began turning around to starboard.

before 05:57

Master B noticed Vessel A and put the rudder to starboard, and informed Vessel C by radio to put the rudder to starboard as Vessel A was approaching.

Master C kept lookout ahead, monitoring the display of the GPS plotter and focusing his attention on maintaining a north heading, and did not notice the approach of Vessel A or the radio message.

until 05:57:57

Master C put the rudder to port in order to counteract the effect of Vessel B being steered to the starboard, to maintain the north heading.

Vessels S sailed while maintaining their course and speed until they drew near to Vessel A.

At about 05:58 to 05:59

Master B began to steer hard to starboard

Master C noticed that Vessel A was approaching and put the rudder hard to starboard.

Collision (At about 05:59)

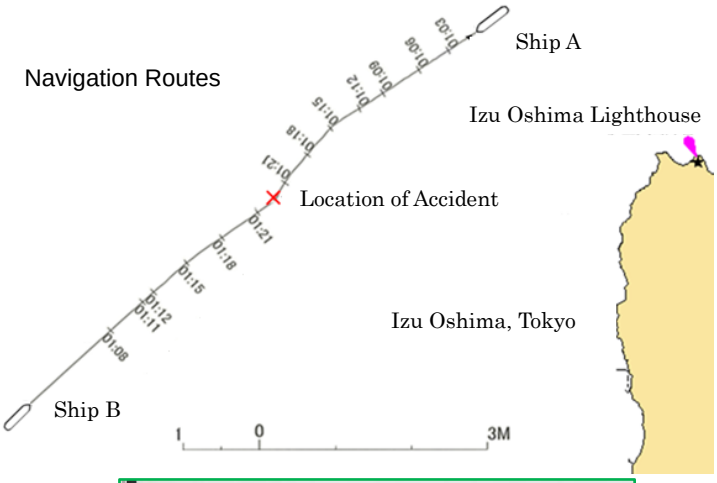
Probable Causes: It is probable that the accident was occurred as, while, both Vessel A was sailing northeast under the pilotage of Pilot A and Vessels S was sailing north, both Vessel A and Vessels S sailed maintaining the their courses and speeds until coming close each other, at night off the west coast of Kansai International Airport.
It is probable that Vessel A maintained its course and speed until coming close to Vessels S because Pilot A thought that changing course or speed would bring Vessel A come close to the surrounding fishing vessels, and Pilot A was unable to decide on a way of avoiding a collision with Vessels S.
It is somewhat likely that Vessels S maintained its course and speed until coming close to Vessel A because, although Master B noticed of Vessel A and steered Vessel B to starboard and talked to Vessel C over the radio, Master C did not notice the approach of Vessel A and the radio communication from Master B, Master C was concentrated on maintaining Master C heading toward north as instructed by the consort vessel's master, and was steering to port in order to maintain the north bearing by counteracting the effect of Vessel B being steered to the starboard.

For details, please refer to the investigation report. (Published on October 29, 2015)
http://www.mlit.go.jp/jtsb/eng-mar_report/2015/2013tk0004e.pdf

Collision of cargo ships with each other, resulting in one ship capsizing and fatalities of all of its crew members

Collision between cargo ship JIA HUI and cargo ship EIFUKU MARU No.18

Summary: The cargo ship JIA HUI (Vessel A, gross tonnage: 2,962 tons) with the master, the officer of the watch and 11 other crew members on board sailing southwest to Busan, South Korea, and the cargo ship EIFUKU MARU No.18 (Vessel B, gross tonnage: 498 tons) with the master, the chief officer and 4 other crew members on board sailing northeast to Chiba port, Chiba prefecture collided off the west of Izu Oshima, Tokyo at about 1:22 on September 27, 2013.
Vessel B capsized and all 6 crew members were killed dead, and Vessel A had damage on the bow but no one was injured or killed dead.



01:06:02 to 01:13:02

Vessel A was proceeding off at a heading of about 235° and at a speed of about 9.3kn.

Officer attempted to pass Ship B with the starboard facing it, by turning to the port even though the bearing of Ship B located at the port bow has altered to about 1.6° to the port.

At around 01:13:30

Officer was in a situation to recognize Ship B at about 2° to the port bow by turning about 5° to the port

At around 01:14:30

Officer was in a situation to recognize Ship B at about 7° to the starboard bow by turning about 10° to the port.

At around 01:20

The bearing of Vessel B had been changed approximately 3° to port, but the Officer thought that he could pass in front of Ship B and did not confirm the change of bearing of Vessel B with a compass (did not notice the course alteration of Vessel B).

Officer turned to the port about 10° toward the front side of Ship B which approached about 0.9M.

At about 01:15:31

Ship B proceeded at the speed of 055° 12.1kn for the course over the ground.

At around 01:16

Chief Officer approached to about 2.2M to Vessel A, altered the course to about 5° to the starboard, and then proceeded almost the same course and speed.

Collision (At around 01:22)

Probable Causes: It is probable that this accident occurred by the collision of both ships at night off the west of Izu Oshima Island, because when Vessel A proceeded to southwest and Ship B proceeded to northeast, Officer A of Vessel A attempted to pass Ship B with the starboard facing it and continued to proceed by repeatedly veering to the port, and Chief Officer B of Ship B proceeded almost the same course and speed.
The reason why Officer A of Vessel A continued to proceed by repeatedly veering to the port by attempting to pass Ship B with the starboard facing it was that he thought that he could pass in front of Ship B and did not confirm the change of bearing of Ship B with a compass. It is probable that he did not notice the bearing of Ship B turning to port.

For details, please refer to the investigation report. (Published on November 26, 2015)
http://www.mlit.go.jp/jtsb/eng-mar_report/2015/2013tk0026e.pdf

Chapter 6 Efforts toward accident prevention

1 Publications

The JTSB prepares and issues various publications, as well as investigation reports, regarding specific cases.

We place these publications on our website and, in order to make them more accessible to the public, we also introduce them through our monthly JTSB E-Mail Magazine service (only available in Japanese).

Our e-mail magazine service is widely used by people in the aviation, railway, and shipping industries, as well as administrative agencies and educational/research organizations.

We also exchange opinions with business operators and other parties on effective information dissemination from the JTSB, and we will continue to make improvements based on the opinions that we receive.

JTSB Website

2 Issuance of the JTSB Digest

With the aim of fostering awareness of safety, and preventing similar accidents from occurring, we issue “JTSB Digests.” This publication introduces you to statistics-based analyses and must-know cases of accidents.

We also issue the English version of “JTSB Digests” as part of our efforts to disseminate information overseas.

In 2015, we released four issues of “JTSB Digests” (January, April, September and December: Issues No. 16-19) as well as one issue of the English version of “JTSB Digests” (January).

The contents of each issue are as follows.

1) JTSB Digests Issue No. 16 [Analyses of Marine Accidents] "Toward the prevention of accidents with casualties during fishing activities by small fishing vessels" (Issued on January 27, 2015)

- Circumstances of each accident
- Case study of an accident investigation: "At night, after casting nets for small trawl net fishing, the skipper fell into the water and died."
- Case study of an accident investigation: " At night, while hauling trawl nets, a crew member was noted missing and although searched for, was not discovered and died."
- Case study of an accident investigation: "While engaging in trawl net fishing, the skipper was caught in a net roller together with nets and died."
- Case study of an accident investigation: "Operation of a control lever in the reverse direction, causing a finger on the operator's right hand to be caught between the rope and windlass and injured."
- Case study of an accident investigation: "A passenger fell into the water, but was wearing a life jacket and used a mobile phone to call 118, allowing quick rescue."

2) JTSB Digests Issue No. 17 [Analyses of Marine Accidents] "Toward the prevention of accidents involving personal water craft" (Issued on April 21, 2015)

- Circumstances of each accident
- Case study of an accident investigation: "Vessel B, which was following close to the stern of Vessel A, collided with Vessel A, which had passed under a wave and come to a stop."
- Case study of an accident investigation: "After an unlicensed operator lost his balance and fell into the water, the vessel sailed on and collided with a swimmer."
- Case study of an accident investigation: "During departure, a passenger in the rear-most area fell toward the back of the seats and into the water, and suffered serious injuries when her lower body was struck by the jet flow."
- Case study of an accident investigation: "A water tube being towed collided with an anchored pleasure boat, and a person on board the water tube was injured."

3) JTSB Digests Issue No. 18 [Introduction of Aircraft Accidents] "About close call incidents in the aviation field" (Issued on September 15, 2015)

- Accident content
- Case study of an accident investigation: "While descending, an aircraft encountered strong rearward turbulence from the preceding aircraft, causing the aircraft to shake and causing two cabin attendants in the rear galley to fall."

・Close call incident case study: “Immediately after takeoff, an aircraft was caught in the rearward turbulence of the preceding aircraft”.
・Case study of an accident investigation: “Case study where a small aeroplane that had landed was disabled due to rearward turbulence from a large passenger aircraft.”
・Case study of a serious incident investigation: “On approach to Kansai International Airport, an aircraft attempted to land at a closed runway, but then made a go-around.”
・Close call incident case study: “An aircraft made an error in the approach route to an airport when landing.”

4) JTSB Digests Issue No. 19 [Analysis of Marine Accidents] “Toward the prevention of fishing vessel accidents - Ensuring the safety of fishing passengers” (Issued on December 15, 2015)

・Circumstances of each accident
・Case study of an accident investigation: “While a ship was anchored, a fishing passenger walking on a bulwark fell into the water and died.”
・Case study of an accident investigation: “A fishing passenger leaning on a cooler on the quarter deck fell into the water and died.”
・Case study of an accident investigation: “A fishing passenger sitting toward the front of the bow deck was tossed into the air and fell due to the shaking of the ship, sustaining injuries.”
・Case study of an accident investigation: “While a ship was drifting, its skipper was taking photographs of fishing passengers and did not notice an approaching ship, which collided with it.”
・Case study of an accident investigation: “While a ship was sailing, its skipper became absorbed in conversations with fishing passengers and did not keep a lookout, and collided with a drifting ship.”
・Case study of an accident investigation: “At night, while a ship was sailing toward a fishing location, it collided with a rocky area and the skipper and fishing passengers were injured.”
・Case study of an accident investigation: “A fishing passenger who was attempting to move from a rocky area to a ship fell from a boarding gangplank into the water and died.”
・Case study of an accident investigation: “While passing through a rocky area, a ship was struck by large waves from the direction of the stern, capsizing and resulting in one fatality and six injuries.”

5) For Prevention of Accidents due to the Shaking of the Aircraft (Issued on January 27, 2015)

3 Issuance of the Analysis Digest Local Office Edition

The JTSB has issued the analysis digest local office edition (only available in Japanese). It has issued this publication in order to provide various kinds of information to help prevent marine accidents. The information is based on the analyses made by our regional offices and relates to specific accidents

that occurred in their respective jurisdictions. This information focuses on cases with characteristic features such as the sea area, the type of vessel, and the type of accident.

(Analysis Digest Local Office Edition in 2015)

Yokohama	**"How to fully enjoy fishing from a boat!!"** **"Toward preventing accidents involving pleasure boats"** (Main content) ・Circumstances of each accident ・Conditions by each accident type ・Steps for preventing recurrence 
Kobe	**Water play equipment: Be careful of things like these too!** **- Added enjoyment with proper use -** (Main content) ・Accidents due to use of water play equipment (4 examples) ・Measures for preventing recurrence 
Hiroshima	**Circumstances of marine accidents in Kurushima Strait and its surrounding areas** (Main content) ・Circumstances of marine accidents in Kurushima strait and its surrounding areas ・Circumstances of accident occurrences and amounts of marine traffic ・Breakdown of accidents ・Analysis of marine accidents in the areas surrounding Kurushima Strait ・Accident case studies (4 examples) ・Points of caution by area of water ・Summary 
	Fireworks displays and marine accidents - **Be careful of oyster rafts. Many accidents occur when they are returning! -** (Main content) ・Marine accidents that occurred at a fireworks display on July 26, 2014 (Saturday) ・Past examples of accidents ・Points for physical safety, and other precautions ・Summary 

Moji	**Circumstances of accidents involving collisions with lighted buoys at Kanmon Port** (Main content) ・Introduction ・Circumstances of occurrence of marine accidents and incidents ・Details on accidents involving collisions with lighted buoys at Kanmon Port ・Accident case studies (2 examples) ・Summary 
Nagasaki	**Circumstances involving accidents due to dozing off during ship operation at the west coast of Kyushu** (Main content) ・Circumstances of occurrence of accidents involving dozing off during ship operation ・Marine accident case studies ・Lessons from accidents ・Summary 
Naha	**Circumstances of capsizing accidents in areas of water with coral reefs** (Main content) ・Introduction: About capsizing accidents in waters with coral reefs ・Circumstances of occurrence of accidents, etc. ・Accident case studies (3 examples) ・Summary: Toward preventing the recurrence of capsizing accidents 

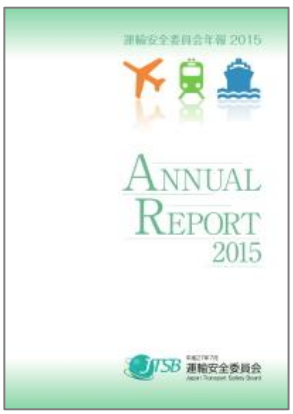
As you read these local office digests, you can not only find out the circumstances of local accidents, but can also gain some tips for accident prevention.

The local offices will make further efforts to regularly issue the analysis digest local office editions. By doing so, they will ensure that you will be provided with more satisfactory content.

4 Issuance of the JTSB Annual Report

In July 2015, we issued the JTSB Annual Report 2015. We did so in order to share the lessons learned from accidents and incidents with interested parties, by introducing our general activities in 2014.

As part of our efforts to provide information overseas, we issued the English version of the report “Japan Transport Safety Board Annual Report 2015” on December 2015. We did so to let people overseas know about the topics in this Annual Report.



Column

Disseminating Information to Marine Leisure Boats

Kobe Office

The areas under the jurisdiction of the JTSB Secretariat Kobe Office include Lake Biwa in Shiga Prefecture, and also large and small swimming beaches and various marine leisure locations along coastal areas. Therefore, we have made efforts to prepare documents analyzing the results of accident investigations involving leisure boats, and have created 3 types of leaflets from 2013 to 2015 based on accident case studies. With the intention of "preventing accidents and reducing damage" which is the duty of the JTSB, we have directly handed these leaflets to safety associations for leisure boats and other parties, as well as to leisure facilities, to communicate this information to the public.

When creating the leaflets, we paid particular attention to the idea of making it easy for people intending to enjoy leisure activities to understand what types of behavior are dangerous and what kind of caution is required, and so designed the leaflets with prominent illustrations so that people reading them could understand their content at a glance.

We received a request to send the leaflets to the Shiga Prefecture Marine Safety Association at Lake Biwa, and they are being distributed to and utilized by participants in training for small marine craft licenses. When we hear of such activities, we feel a strong sense of satisfaction and have the heartfelt wish for marine accidents in leisure areas, not just at Lake Biwa but in all ocean and marine areas, to be eliminated.

Trilogy of Leisure Boat Leaflets

*We received a request from the Marine Sports Foundation to cite the content and illustrations from the leaflets our office has created, and posters like this one have been distributed.

We would like to continue engaging in the creation of such leaflets so that maritime safety can be preserved, and to disseminate information appropriately and as necessary.

Illustration displayed at Nishikinohama Park in Kaizuka City, Osaka

5 Mobile Version of J-MARISIS: Toward Expanding Users

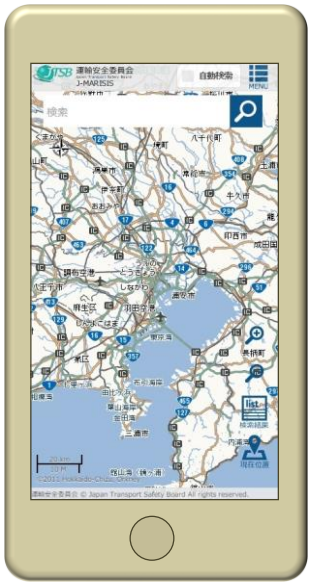
For the effective utilization of published marine accident reports, the JTSB began providing the Japan-Marine Accident Risk and Safety Information System (J-MARISIS) as an Internet service from the end of May 2013, allowing users to conduct searches of reports from maps. In April 2014, we also released the global version of J-MARISIS, further allowing users to search investigation reports published by overseas marine accident investigation organizations from world maps.

The number of people using the Internet on smartphones, tablets and other mobile terminals has been increasing in recent years, and after receiving requests to make this system easier to use on mobile terminals, we released the mobile version of J-MARISIS at the end of June, 2015.

With touch panel support as well as revised display buttons and layouts, its ease of use has been increased and by using the GPS functions of mobile terminals, it is able to display information on areas near to the user's current location.

It is possible to view the same content, including accident information, as the conventional PC version, so users on small vessels such as pleasure boats or fishing vessels can easily use their smartphones or tablets to check information on accidents in areas of water they are intending to navigate to, and we hope that it will be useful in promoting safe ship operation.

URL http://jtsb.mlit.go.jp/hazardmap/mobile/index_en.html



Top Page

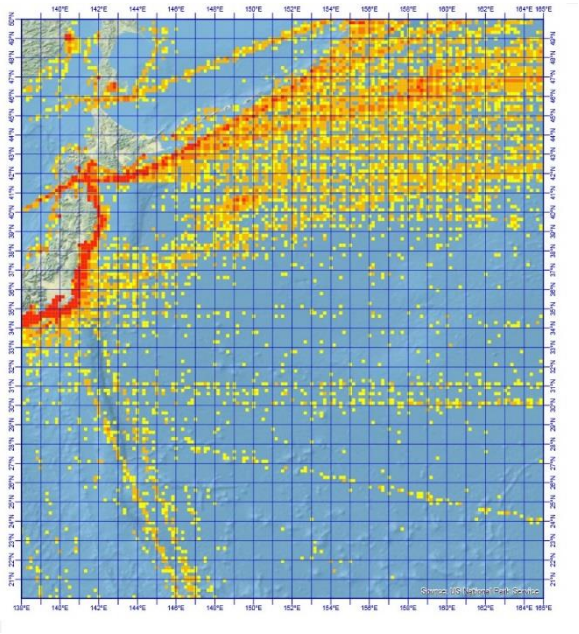
Screen displaying information near to the user's current location, using GPS functions

Screen displaying accident information

Column

About Ship Density According to the Space-based Automatic Identification System Experiment

Director for Analysis, Recommendation and Opinion



With cooperation from the Japan Aerospace Exploration Agency (JAXA), the JTSB is in the process of having ship density maps created from the results of the Space-based Automatic Identification System Experiment (SPAISE*).

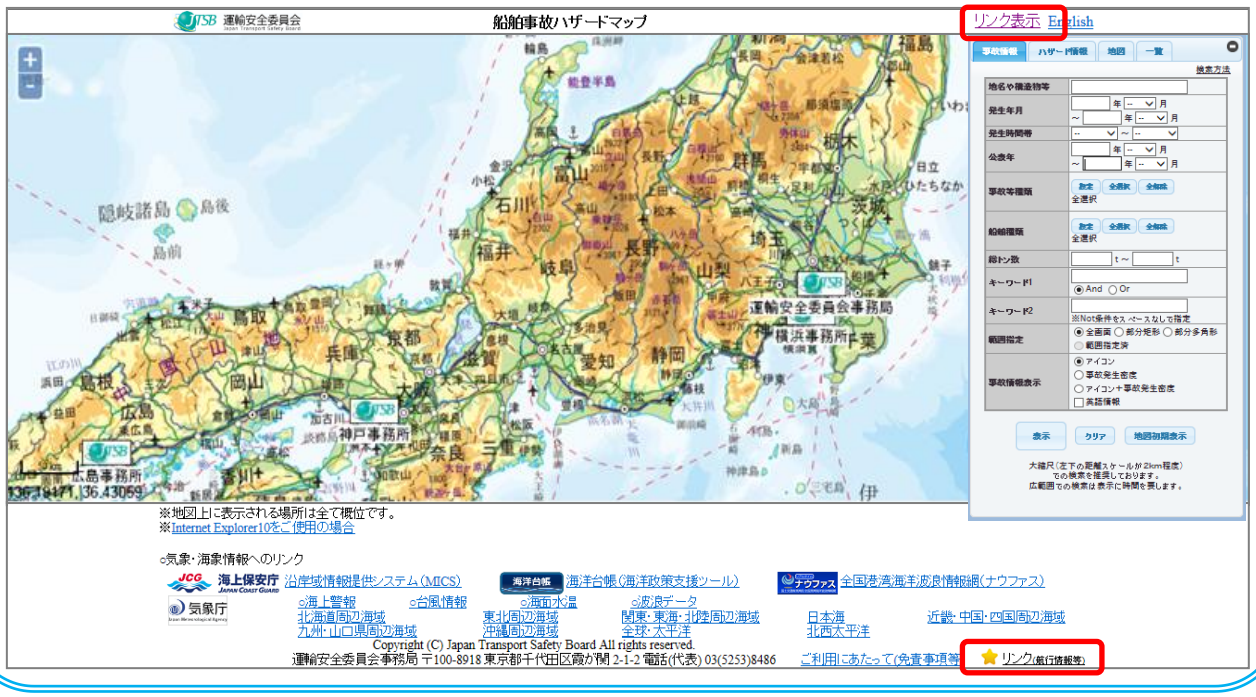
Data had previously been collected in alternating weeks using the Small Demonstration Satellite #4 (SDS-4), but with the operation of Daichi #2 (ALOS-2) which started from 2015, data can be collected every day, greatly increasing its precision.

The diagram to the left is a ship density map released on our website, of marine traffic over the one-year period of 2015. In addition to this, we are also releasing ship density maps of information for each quarter (ship density becomes higher in the sequence yellow → orange → red).

By clicking the "Links" on the J-MARISIS, the "☆ Links (Navigation Information, etc.)" displayed in the field below them can be used to jump to the ship density map page, so please feel free to view them (only available in Japanese).

We will continue to listen to the opinions and requests of our users and intend to apply them to enrich this content even further. Thank you for your support.

*Space-based Automatic Identification System Experiment "SPAISE"
http://www.satnavi.jaxa.jp/experiment/spaise/



6 Outreach lectures (dispatch of lecturers to seminars, etc.)

The Japan Transport Safety Board launched a series of outreach lectures in April 2014, as part of its efforts to raise awareness on the work of the Board, and to create an opportunity for collecting the feedback and opinions of the general public.

Seminars that lecturers can be dispatched to cover topics that are useful in preventing or mitigating damage from aircraft, railway, and marine accidents. Members of the staff are dispatched as lecturers to various seminars and schools.

Scene of an outreach lecture

We can provide flexible support for the content of lectures, such as by incorporating content to match the needs of participants, based on courses chosen by requesting groups.

Please refer to the website of the Japan Transport Safety Board on application procedures.
http://www.mlit.go.jp/jtsb/demaekouza.html (in Japanese)

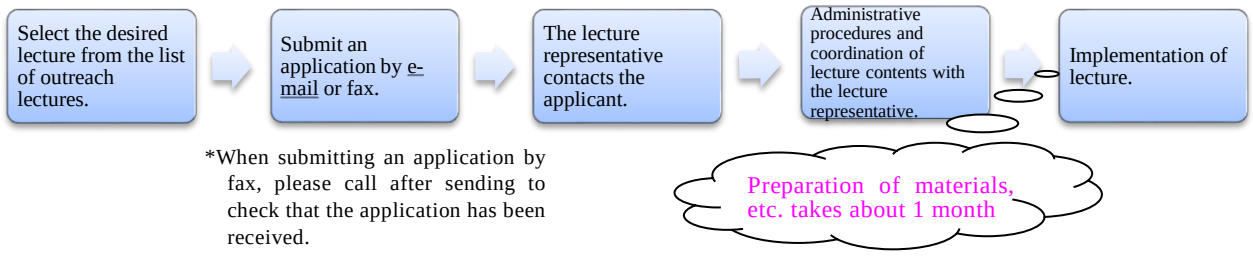
List of outreach lectures

No.	Course	Main audience	Contents
1	About the Japan Transport Safety Board	General (High school students and older), transportation businesses, etc.	Easy-to-understand explanation about the organizational background, work, etc. of the Japan Transport Safety Board
2	What is accident investigation?	Elementary school students	Easy-to-understand explanation about accident investigation for elementary school students and older
3	About aircraft accident investigation	General (High school students and older), aviation businesses, etc.	Easy-to-understand explanation about aircraft accident investigations, including the background, concrete examples, etc.
4	About railway accident investigation	General (High school students and older), railway businesses, etc.	Easy-to-understand explanation about railway accident investigations, including the background, concrete examples, etc.
5	About marine accident investigation	General (High school students and older), maritime businesses, etc.	Easy-to-understand explanation about marine accident investigations, including the background, concrete examples, etc.
6	About the JTSB Digests	General (High school students and older), transportation businesses, etc.	Introduction to case studies of accidents and explanation of various statistical materials across various modes, based on the JTSB Digests that have been issued to date.
7	About the JTSB Digests (Analyses of Aircraft Accidents)	General (High school students and older), aviation businesses, etc.	Explanation about various themes taken up in the analyses of aircraft accidents in the JTSB Digests.
8	About the JTSB Digests (Analyses of Railway Accidents)	General (High school students and older), railway businesses, etc.	Explanation about various themes taken up in the analyses of railway accidents in the JTSB Digests.

9	About the JTSB Digests (Analyses of Marine Accidents)	General (High school students and older), maritime businesses, etc.	Explanation about various themes taken up in the analyses of marine accidents in the JTSB Digests.
10	Trends in the occurrence of marine accidents, and preventing recurrence	General (High school students and older), maritime businesses, etc.	Schematic explanations about risks and waters where marine accidents frequently occur using the J-MARISIS, and explanations about accident prevention methods.
11	Analysis digests of regional offices (marine accident-related) [each regional office in Hakodate, Sendai, Yokohama, Kobe, Hiroshima, Moji, Nagasaki, and Naha]	General (High school students and older), maritime businesses, etc.	Explanations on each topic regarding analysis digests from regional offices. *Lists can be found by clicking the link below. http://www.mlit.go.jp/jtsb/bunseki-kankoubutu/localanalysis/localanalysis_new.html

*No. 11, in principle, is restricted to requests from the areas under the jurisdiction of the local office.

Flow chart from application to implementation of lecture



7 Activities of the Accident Victim Information Liaison Office

The Japan Transport Safety Board gives full consideration to the emotions of the victim and their families, as well as bereaved families. In addition to providing information on accident investigations in an appropriate manner at the appropriate time, a contact point for providing accident investigation information to victims, etc. was established in April 2011 with the aim of providing attentive response to opinions and feedback. Furthermore, in order to promote the provision of information, the Accident Victim Information Liaison Office was established under the directive of the organization in April 2012. Contact points for the provision of information were also set up in local offices to provide integral support alongside with Tokyo.

In 2015, information on accident investigation and other matters was provided to 61 persons, including the victims, of 29 cases of aircraft/railway/marine accidents.

The status for other activities is as follows.

○ Memorials for accident victims

2015 was a significant memorial year that marked the passage of 30 years since the crash of Japan Airlines Flight 123 on Mount Osutaka, 15 years since the Eidan subway Hibiya Line train derailment, and 10 years since the JR Fukuchiyama Line derailment and the Takenotsuka level crossing accident. To express our deepest sympathy for those lost in these accidents, the JTSB presented offerings of flowers from the Board members and Director-General at each accident site.

By presenting these memorial offerings first-hand, we deeply felt the emotions of those who still

have painful memories of these events, and renewed our awareness of the importance of closely sharing the feelings of bereaved families and victims.

Prayer at the altar for flowers at the Mount Osutaka crash site

Prayer at the altar for flowers at the Takenotsuka level crossing accident site

○ Participation in “Memorial and Safety Meeting 2015” for the derailment accident on the JR Fukuchiyama Line

On April 25, 2015, the “Memorial and Safety Meeting 2015: The Importance and Significance of Railway Safety – ‘10 Years of Joint Accident Verification’” was held to mark the 10th year since the April 25, 2005 Fukuchiyama Line derailment accident.

The meeting included speeches by members of bereaved families as well as by experts, and although 10 years have passed since the accident, there are still questions of whether there may be points remaining that should be verified, and we reaffirmed the importance of providing information related to our investigations, starting with the provision of accident investigation reports to victims and bereaved families.

Scene of a speech

The Accident Victim Information Liaison Office hands out "Contact Information Cards" to victims of accidents.

The Office receives inquiries and consultation about the accident investigations from victims and families of accidents, as well as bereaved families. Please feel free to contact the following where necessary.

Contact Information Cards

(Front)

(Back)

Chapter 7 International efforts for accident prevention

1 Objectives and significance of international cooperation

Aircraft and marine accidents, which are part of Japan Transport Safety Board's investigation scope, are international in nature. Creating and operating systems for these kinds of investigations therefore involve international organizations. Also, it is necessary to cooperate and coordinate with the accident investigation authorities of the states concerned during the investigation process.

In addition to the nation where an aircraft accident occurred, the state of registry, the state of the operator, and the state where the aircraft was designed and manufactured are the states concerned. An annex to the Convention on International Civil Aviation (the Chicago Convention) states that the state of occurrence is responsible for starting and accomplishing an accident investigationwhile the other states also have the right and responsibility to appoint a representative to participate in the investigation. Proper cooperation with the accident investigation authorities of those states concerned is necessary for the accomplishment of the investigation.

Similarly, in marine accidents involving vessels above a certain level, the International Convention for the Safety of Life at Sea (SOLAS) places the obligation of investigation on the flag state of the vessel. Additionally, other states concerned, such as coastal states in whose territory the marine accident occurs and the state(s) of victims are entitled to investigate the accident. The convention defines the standard framework of marine accident investigations. The flag state and states concerned must cooperate with each other in multiple ways, such as through information sharing, when conducting accident investigations.

Based on this background, a variety of international meetings are held for each mode, which JTSB actively participates in. The meetings are for the purpose of facilitating collaboration in the case of accidents or incidents, sharing information on accidents and investigation methods on a regular basis, and achieving results of prevention for repeated accidents all over the world. Additionally, for the investigation of railway accidents, for which there is no international organization, various international seminars to exchange information on accident and incident investigations are held in major countries. In regards to this, the fundamental investigation system of each state is generally standardized. Furthermore, some universities overseas have specialized training courses for accident and incident investigations, to which JTSB is also actively dispatching investigators.

As shown above, JTSB aims to improve transport safety in Japan and all over the world. It hopes to do so through sharing of our findings worldwide, which have been acquired in individual accident and incident investigations. Relating to this, the following sections introduce each of our international activities in 2015.

2 Efforts of international organizations and JTSB's contributions

(1) Efforts of the International Civil Aviation Organization and JTSB's involvement

The International Civil Aviation Organization (ICAO, Headquarters: Montreal, Canada) was established as a specialized agency of the United Nations in 1947. Japan acceded to it in 1953. ICAO

comprises the Assembly, Council, Air Navigation Commission (a supporting body of the Council), Legal Committee, Air Transport Commitee, Committee on Joint Support of Air Navigation Services, all of which are the subordinate bodies of the Council, secretariat and regional offices. In addition, Air Navigation Conferences, Regional Air Naviation meetings, a variety of working groups and panel meetings, which are called in for certain projects. As of March 2016, 191 states are members of ICAO.

The objectives of ICAO is provided in Article 44 of the Convention on International Civil Aviation as being "to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport." ICAO is engaging in a wide variety of activities, including the drafting of conventions regarding international air transport services and aviation security such as countermeasures against hijacking. It also engages in audits of contracting states' safety monitoring systems, and responses to environmental problems.

ICAO establishes the Annexes of the Convention on International Civil Aviation for items that must be covered by globally unified rules. The Annexes determines the rules for 19 fields, including personnel licensing, rules of the air, registration of aircraft, airworthiness, aeronautical telecommunications, search and rescue, security, and the safe transport of dangerous goods and safety management. Among them, Annex 13 establishes the standards and recommendations for aircraft accident and incident investigations. In addition, the Act for the Establishment of the Japan Transport Safety Board states that: "The Board shall conduct investigations prescribed in items (i) to (ii) of Article 5 in conformity with the provisions of the Convention on International Civil Aviation and with the Standards, Practices and Procedures adopted as Annexes thereto." (Article 18).

Since November 2013, the 14th amendment of Annex 13, which included the addition of the definition of contributing factors, has been in effect along with Annex 19 (Safety Management), which is new.

In addition, ICAO established the Regional Aviation Safety Group, Asia and Pacific Regions, (RASG-APAC) in 2011. This group operates as a new framework for safety in Asia and Pacific Regions. Under this group, a subordinate group, the Asia Pacific Accident Investigation Group (APAC-AIG), considers the building of a cooperative system for accident investigation in these regions. JTSB dispatched the director for international affairs and an aircraft accident investigator to the meeting, which was held in Colombo, Sri Lanka in June 2015.

(2) Efforts of the International Maritime Organization and JTSB's involvement

The International Maritime Organization (IMO, Headquarters: London, United Kingdom) was established in 1958 as a specialized agency of the United Nations. It was originally called as the Inter-Governmental Maritime Consultative Organization (IMCO). The IMO comprises the Assembly, the Council and five committees. These are the Maritime Safety Committee (MSC), Legal Committee (LEG), Marine Environmental Protection Committee (MEPC), Technical Co-operation Committee (TC) and Facilitation Committee (FAL). In addition, there is a Secretariat, and the MSC (and MEPC) has seven subcommittees. As of March 2016, IMO has 171 member states/teritorries and three regions as associate members.

IMO engages in various activities, such as the facilitation of intergovernmental cooperation, effective safety measures and drafting of conventions that relate to technical and legal problems with maritime life safety and safe marine navigations. The Sub-Committee on Implementation of IMO Instruments (III) is a subordinate group of MSC and MEPC. It discusses how to ensure the responsibility of the flag state, including the investigation of marine accidents and incidents. III analyzes the accident or incident investigation reports submitted from states based on SOLAS and the International Convention for the Prevention of Pollution from Ships (MARPOL) to draw lessons from, which III subsequently makes public on the IMO website. By doing so, III promotes activities for the prevention of the repeated occurrence of marine accidents. The Correspondence Group (which undertakes analysis during periods outside of the sessions) and the Working Group (which verifies the analysis results during the session period) comprises volunteer investigators from some member states. They discuss these analysis results, which the III plenary subsequetly approves. Depending on the matter in question, if III determines that further discussion is required for a convention revision, it will submit recommendations or information to MSC, MEPCand other IMO subcommittees. The III2 was held in July 2015. In this event, JTSB's marine accident investigators took part as group members and analyzed accident investigation reports from various states. Tentative translations of these analysis results are published on JTSB website.

III2

(URL: http://www.mlit.go.jp/jtsb/casualty_analysis/casualty_analysis_top.html)

3 Cooperation and information exchange with foreign accident investigation authorities and investigators

(1) Participation in international meetings

① Chairman meeting of the International Transportation Safety Association

The International Transportation Safety Association (ITSA) was established by accident investigation boards from the Netherlands, the United States, Canada, and Sweden in 1993. As of March 2016, the international organization has members from the transport accident investigation authorities of 16 countries and teritorries. Organizations that are permitted to join must be permanent accident investigation bodies that are independent from any regulatory body.

Based on the idea that any findings from an accident and incident investigation in one field can be used as a lesson for another field, ITSA holds annual chairman meetings where the participating accident investigation authorities present their experiences in accident investigation. These presentations are for all the modes of aviation, railway, and marine accidents and incidents. The chairpersons learn about the causes of accidents and the methodologies of

Participants in the ITSA chairman meeting (United Kingdom)

accident investigations, thus aiming to improve transport safety in general. As for Japan, the Aircraft and Railway Accidents Investigation Commission was approved for accession in June 2006. The board has participated in all the meetings held after 2007.

Chairperson Goto (at that time) from the JTSB participated in the conference held in London, United Kingdom in May 2015, and provided explanations about the background of the establishment of the JTSB, examples of its investigations, and other matters.

② Board meetings of the International Society of Air Safety Investigators and the Asian Society of Air Safety Investigators

The International Society of Air Safety Investigators (ISASI) has been organized by national aircraft accident investigation authorities. The purpose of this society is to support accident investigations aimed at preventing repeating occurrences of aircraft accidents and incidents. This aims is to be achieved by improving further a cooperative system of investigation bodies, through the facilitation of communications between member countries about their experience and knowledge, as well as information about the technical aspects of aircraft accident investigations.


ISASI (Germany)

ISASI holds annual seminar each year, and the Japan Aircraft Accident Investigation Commission has participated in each one of them since its establishment in 1974. In this seminar, a flight recorder workshop, an accident investigation training workshop, a cabin safety workshop and a government investigators meeting are held in parallel with the general meeting. Japan also participates in these workshops to contribute to technical improvements in these areas.

The annual seminar in 2015 was held in Augsburg, Germany, with the theme “Independence does not mean isolation”. This was attended by aircraft accident investigators from the JTSB, who participated in active exchange of opinions with accident investigation personnel from various countries.

ISASI has regional associations in Australia (ASASI), Canada (CSASI), Europe (ESASI), France (ESASI French), Latin America (LARSASI), New Zealand (NZSASI), Russia (RSASI), the United States (USSASI) and Asia (AsiaSASI). Each of these associations also holds their own seminars.

In AsiaSASI, the Hong Kong Civil Aviation Department currently serves as the Chairman, with JTSB as the Vice Chairman, and the Air Accident Investigation Bureau of Singapore as the Secretariat.

③ The Accident Investigator Recorder (AIR) Meeting

The Accident Investigator Recorder (AIR) Meeting is an international conference for aircraft accident investigators who analyze digital flight data recorders (DFDR) and cockpit voice recorders (CVR). At this meeting, aircraft accident investigation analysts from all over the world share know-

how by exchanging their experience, knowledge, information relating to the analysis of DFDR, and discuss the relevant technologies on DFDR. The conference aims to further develop the technical capacity of accident investigation authorities around the world and to further improvement the cooperative system amongst the authorities.

This meeting was established in 2004, and the accident investigation bodies of each country hold a meeting every year. JTSB has participated in nearly all the conferences since 2006.

The 2015 conference was held in September in Washington, United States. JTSB dispatched aircraft accident investigators to acquire the latest information and know-how for the analysis of flight recorders. This was achieved through the exchange of information and ideas with foreign accident investigation analysts.

④ The Marine Accident Investigators' International Forum

The Marine Accident Investigators' International Forum (MAIIF) is an international conference held annually since 1992. It was originally based on a proposal from the Transportation Safety Board of Canada. Its purpose is to maintain and develop international cooperation among marine accident investigators and to foster and improve international cooperation in marine accident investigations. Its aim is to advance maritime safety and prevent marine pollution. In 2008, MAIIF was granted the status of an Inter-Governmental Organization (IGO) in IMO.

Under this forum, marine accident investigators around the world take the opportunities to exchange frankly opinions and share information on marine accident investigations. Recently, there has been more demand to make use of the findings obtained from the marine accident and incident investigations in the discussions in IMO. In 2009, MAIIF made a proposal based on the investigation results from the state investigation authorities to IMO for the first time. Japan has joined and actively contributed to the forum every year since the third conference and hosted the eighth conference in Tokyo in 1999.

At the 24th conference held in Antalya in Turkey in September 2015, the senior marine accident investigator and director for international affairs from the JTSB attended the conference and delivered presentations on fires occurring on car carrier ships, collision accidents involving foreign ships, and other topics.

⑤ The Marine Accident Investigators Forum in Asia

The Marine Accident Investigators Forum in Asia (MAIFA) was established by a proposal from Japan to build a mutual cooperation system for marine accident and incident investigations in the Asia region and to assist developing countries in enhancing their investigation systems. Since 1998, meetings have been held annually, and Japan has been playing a leading role in this forum, including the sponsorship of the 13th meeting in Tokyo in 2010. The network of investigators that has been established through the forum is now effective in its promotion of rapid and smooth

MAIFA18 (Singapore)

international cooperation in accident and incident investigations. Encouraged by the success of MAIFA, E-MAIIF was established in Europe in 2005. A-MAIF was then established in North, Central and South Americas in 2009. These trends contribute more than ever in furthering the exchange and cooperation between marine accident investigators in each region. In the Asia region, there are not only a lot of straits with sea traffic congestion, but also severe weather and hydrographic phenomena that often give rise to tragic marine accidents. Nonetheless, some countries have insufficient capacities or systems for accident investigations. This situation makes these regional fora very important.

In the 18th meeting held in Singapore in August, 2015, a marine accident investigator from the JTSB participated, and delivered a presentation about hull listing accidents involving ferries.

(2) Examples of international cooperation among accident investigation agencies in individual cases

For the aircraft accident and incident investigations, based on the provisions in Annex 13 of ICAO, the state where an aircraft accident occurred must notify the state of registry, the state of design/manufacturing, and the state of operation. If necessary, these states concerned may appoint their own Accredited Representative (AR) to join the investigation.

With regard to the case relating to the batteries of the Boeing 787 aircraft, which occurred in Boston, United States, in January 2013, together with a similar case that occurred in Japan immediately after that, an investigation was conducted jointly with the accident investigation agency of the United States, and the final report was compiled in the following year. Also, as for the accident rsulting in an injured crew member on a Japan-registered aircraft that had encountered turbulence in South Korea, which took place in September 2014, investigations were conducted by the JTSB in response to a request from the accident investigation authority of South Korea, and the accident investigation report was published in May 2015. Furthermore, regarding the accident which occurred at Hiroshima Airport involving an Airbus A320-200 operated by Asiana Airlines in April 2015, South Korea and France appointed ARs to participate in the investigation, and the JTSB conducted its investigations in cooperation with the respective accident investigation authorities.

In marine accident and incident investigations, the IMO Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code) states that the interested states, including the flag state of the ship and the coastal state of the accident, must cooperate in the marine accident investigation. Also in Japan, if a marine accident or incident occurs that concerns more than one state, Japan’s accident investigators are to collaborate with the accident investigation authorities of the other interested states in order to obtain information about the accident.

Among the marine accidents and incidents that the JTSB launched investigations in 2015, with regard to the three serious accidents involving foreign ships, the accident investigation authorities of the countries to which the ships were registered were notified of the accidents.

With regard to the accident involving the Cambodian cargo ship MING GUANG which foundered off the coast of Ajigasawa Town, Aomori Prefecture, in December 2014, JTSB conducted

investigations after obtaining certification documents related to the ship via the accident investigation authority of the flag state of Cambodia, and the accident investigation authorities of China, the location of the ship management company.

Among the marine accident and incident investigation reports that were published in 2015, JTSB sent six draft reports to the flag states upon request, in order to ask for their comments.

4 Participation in overseas training

JTSB is making efforts to advance the capacity of accident investigators through measures such as training and international information exchanges to investigate accidents accurately, and also actively participates in overseas training for accident investigations.

In 2015, JTSB made efforts to improve our accident investigation capabilities, continuing from the previous year to dispatch an aircraft accident investigator and a marine accident investigator to Cranfield University in the UK, which has a good track record in accident and incident investigation training, and also dispatching an aircraft accident investigator to the aircraft accident investigation training held by the USA's National Transportation Safety Board (NTSB). The content of each training session lets the participants learn about a variety of topics, from the basics to expert knowledge about accident investigations. After the training, the participating investigators made the other investigators of each mode of transport aware of what was learned in the training, thereby helping to improve the capabilities of all of our investigators.

JTSB also dispatches aircraft accident investigators to training held by US manufacturers to familiarize themselves with methods for using tools to retrieve and analyze data from damaged DFDRs and CVRs, in preparation for future investigations.

Column

Smooth Information Exchange: Communication with Foreign Countries

Director for International Affairs

As to the accident and incident investigations, as described in "Chapter 7: International Efforts for Accident Prevention", in addition to the efforts made for activities by the International Civil Aviation Organization and International Maritime Organization, and even recently in the railway field which has no international organization, the importance of sharing safety measures related to accident investigations internationally is growing, and cases involving communication with accident investigation organizations in foreign countries are continuing to increase.

Although e-mail is more commonly used than telephones as a method of everyday communication, depending on country, there are many instances where replies cannot be received without waiting until the following morning due to time differences. Foreign countries also have their own national holidays or it may be common practice, for example, to take longer summer vacations than in Japan, with replies failing to be received as expected in certain cases.

Additionally, there is a need to ensure the security of materials shared among relevant parties. Therefore, materials attached to e-mails sent from the JTSB to external parties are automatically encrypted by security systems before their transmission, but there may be cases where the receiver's security system might determine the encrypted materials to be suspicious files and not accept them, and there is a growing number of cases where receivers inform the senders that "Attachment files could not be opened." or that "Password has not been received."

The level of security may also be different from country to country, leading to a number of troubles in sending materials.

At times, telephone conferences are held with accident investigation organizations in multiple countries. When setting up such conferences, first of all, a time must be found for them that is not an unreasonably late hour at night for any participating country. Telephone conferences with America and Europe often begin at around 9:00 pm in Japan (this is midday in Europe and early morning in America, but since America and Europe use daylight savings time in summer, the actual starting time may change depending on the season), preventing participants in Japan from returning home until late at night.

In telephone conferences, it also often becomes difficult to determine who is speaking at any given time, speakers may be difficult to understand due to poor sound quality, or it may be difficult to determine the appropriate timing to enter a discussion. Therefore, at the JTSB, telephone conference devices (microphone speakers) are connected to telephones, and three to four staff members face these devices to participate in discussions.

Microphone speaker for conferences

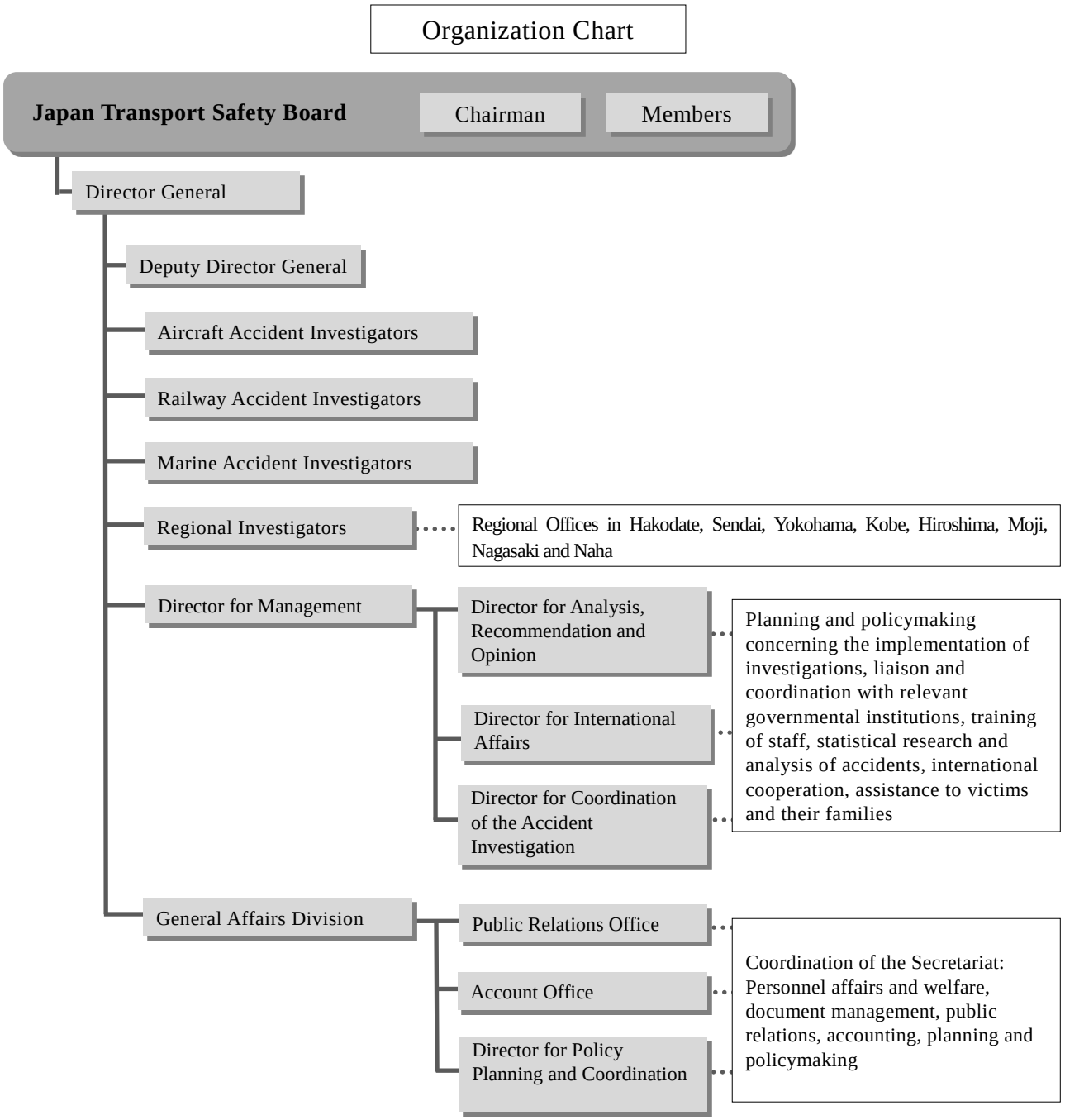
Even though advances in telecommunications technology have allowed information to be shared around the world instantly, special measures must still be taken to deepen the understanding of content among relevant parties effectively. We will continue to strive to achieve smooth communication with foreign countries, and hope to be able to expand the circle of international cooperation in accident investigations.

Appendixes

Appendixes

1 Outline of the organization

The Japan Transport Safety Board consists of the Chairman, 12 members, and 178 secretariat staff (as of the end of March 2015). The staff in the secretariat consist of investigators who conduct investigations of aircraft, railway and marine accidents; the General Affairs Division that performs coordination-related jobs for the secretariat; and the Director for Management who is dedicated to the support and statistical analysis of accident investigations, and international cooperation. In addition, special support staff and local investigators are stationed at eight regional offices around the country (Hakodate, Sendai, Yokohama, Kobe, Hiroshima, Moji, Nagasaki and Naha). These local investigators investigate marine accidents (excluding serious ones) and support staff provide initial support for aircraft, railway and marine accidents.



2 Deliberation items of Board and each Committee

When investigations of accidents have progressed and the facts, as well as the causes and factors of accidents, have become clear to a certain extent, accident investigators put these results together and prepare a draft investigation report. This draft is then deliberated in the Board or Committees. As indicated in the table below, matters related to extremely serious accidents are deliberated in the Board, and matters related to particularly serious accidents are deliberated in the General Committee, and so nearly all draft investigation reports are deliberated in committees set up for each transport mode (Aircraft, Railway, Marine and Marine Special Committees).

The Board is composed of eight full-time members, including the Chairman, and five part-time members, with its assemblies convened by the Chairman. The Committees are composed of members with expertise related to each Committee, and their meetings are convened by their own Committee Directors. Any matters shall be decided by a majority of the members present for both the Board and Committees, and for both of these, a meeting cannot be convened and a decision cannot be made unless more than half of the members are present.

The Board (Committee) meeting is also attended by the Director General, Deputy Director General, Director for Management, Investigators concerned from the Secretariat.

Deliberation items of Board and each Committee

Board and Committees	Matters to be deliberated
Board	・Matters that the Board considers as extremely serious accidents based on the scale of damage and other matters including social impact
General Committee	・Matters related to particularly serious accidents (i) An accident involving ten or more persons killed or missing (ii) An accident involving twenty or more persons killed, missing or seriously injured (With regard to aircraft accidents and a marine accidents, (i) and (ii) are limited to passenger transport services.) ・Any other matters deemed to be necessary by the Board
Aircraft Committee	・Matters related to aircraft accidents and aircraft serious incidents (excluding the accidents to be handled by the General Committee)
Railway Committee	・Matters related to railway accidents and railway serious incidents (excluding the accidents to be handled by the General Committee)
Marine Committee	・Matters related to marine accidents and marine incidents as may be deemed serious by the Board (excluding the accidents to be handled by the General Committee and the Marine Special Committee)
Marine Special Committee	・Matters related to marine accidents and marine incidents (excluding the accidents to be handled by the General Committee and the Marine Committee)

3 Board Members

As of April 1, 2016

Kazuhiro Nakahashi, Chairman (Full-time), Director of Aircraft Committee

Kazuhiro Nakahashi was appointed as Chairman on February 27, 2016; in charge of the Aircraft Committee, the Railway Committee and the Marine Committee; specializes in Aerospace engineering and Computational fluid dynamics

Career summary: Doctor of Engineering, Graduate School of Engineering, The University of Tokyo
Former Professor for Graduate School of Engineering, Tohoku University
Former Vice President for Japan Aerospace Exploration Agency

Toshiyuki Ishikawa, Member (Full-time)

Toshiyuki Ishikawa was appointed as member on March 15, 2010, currently in the third term of office; in charge of the Aircraft Committee, the Railway Committee and the Marine Committee; specializes in legislation of administrative law and the others

Career summary: Doctor of Law, Graduate School of Law, Chuo University
Former Professor for Law School, Chuo University

Toru Miyashita, Member (Full-time), Deputy Director of Aircraft Committee

Toru Miyashita was appointed as member on February 27, 2016; in charge of the Aircraft Committee; specializes in Operation and Maintenance of Aircraft

Career summary: Graduated from Department of Aeronautics, Faculty of Engineering, The University of Tokyo
Former Executive Director for Association of Air Transport Engineering & Research

Sadao Tamura, Member (Full-time)

Sadao Tamura was appointed as member on December 6, 2010, currently in the second term of office; in charge of the Aircraft Committee; specializes in Flight Operations

Career summary: Former General Manager of Operations Support Office, Flight Operations Department, All Nippon Airways Co., Ltd.

Akira Matsumoto, Member (Full-time), Director of Railway Committee

Akira Matsumoto was appointed a member on October 1, 2007, currently in the third term of office; in charge of the Railway Committee; specializes in railway engineering and safety engineering

Career summary: Graduated from Department of Mechanical Engineering, Faculty of Engineering, Yokohama National University

Former Executive Researcher for Safety Technologies of New Urban Transportation Systems, National Traffic Safety & Environment Laboratory

Shigeru Yokoyama, Member (Full-time), Deputy Director of Railway Committee

Shigeru Yokoyama was appointed as member on December 6, 2013; in charge of the Railway Committee; specializes in electrical engineering and electronics

Career summary: Doctor of Engineering, Department of Electronics, Faculty of Engineering, The University of Tokyo

Former Professor for Department of Electrical and Electronic Engineering, Shizuoka University

Kuniaki Shoji, Member (Full-time), Director of Marine Committee

Kuniaki Shoji was appointed as member on October 1, 2011, currently in the second term of office; in charge of the Marine Committee and the Marine Special Committee; specializes in marine engineering and naval architecture

Career summary: Doctor of Engineering, Graduate School of Engineering, The University of Tokyo

Former professor, Faculty of Marine Technology, Tokyo University of Marine Science and Technology

Satoshi Kosuda, Member (Full-time), Deputy Director of Marine Committee

Satoshi Kosuda was appointed as member on October 1, 2014; in charge of the Marine Committee and the Marine Special Committee; specializes in maneuvering of ship

Career summary: Graduated from the Department of Navigation at Kobe University of Mercantile Marine

Former Investigator-General for Marine Accident of Japan Transport Safety Board

Keiji Tanaka, Member (Part-time)

Keiji Tanaka was appointed as member on February 27, 2013, currently in the second term of office; in charge of the Aircraft Committee; specializes in flight simulation and flight dynamics

Career summary: Doctor of Engineering, Department of Aeronautics, Faculty of Engineering, The University of Tokyo

Former Professor for Aerospace Engineering Course, Monozukuri Engineering Department, Tokyo Metropolitan College of Industrial Technology

Miwa Nakanishi, Member (Part-time)

Miwa Nakanishi was appointed as member on February 27, 2016; in charge of the Aircraft Committee; specializes in Ergonomics (Human factors)

Career summary: Doctor of Engineering, School of Science for Open and Environmental

Systems, Graduate School of Science and Technology, Keio University
Associate Professor for Department of Administration Engineering, Faculty of Science and Technology, Keio University

Norio Tomii, Member (Part-time)

Norio Tomii was appointed as member on October 1, 2007, currently in the third term of office; in charge of the Railway Committee; specializes in railway operation planning and management

Career summary: Doctor of Informatics, Graduate School of Informatics, Kyoto University
Professor for Department of Computer Science, Faculty of Information and Computer Science, Chiba Institute of Technology

Miyoshi Okamura, Member (Part-time)

Miyoshi Okamura was appointed as member on December 6, 2010; currently in the second term of office; in charge of the Railway Committee; specializes in structural engineering, earthquake engineering and maintenance management engineering (steel structural engineering)

Career Summary: Doctor of Engineering, Graduate School of Engineering, University of Yamanashi
Associate Professor for Department of Research Interdisciplinary Graduate School of Medicine and Engineering, University of Yamanashi

Mina Nemoto, Member (Part-time)

Mina Nemoto was appointed as member on October 1, 2008, currently in the third term of office; in charge of the Marine Committee and the Marine Special Committee; specializes in ergonomics (human factors)

Career summary: Doctor of Philosophy, Graduate School of Media and Governance, Keio University
Senior Consultant, Marine Technical Group, Japan Marine Science Inc.

The chairman and members of the Board shall be appointed by the Minister of Land, Infrastructure, Transport and Tourism with the consent of both houses of Representatives and Councilors.

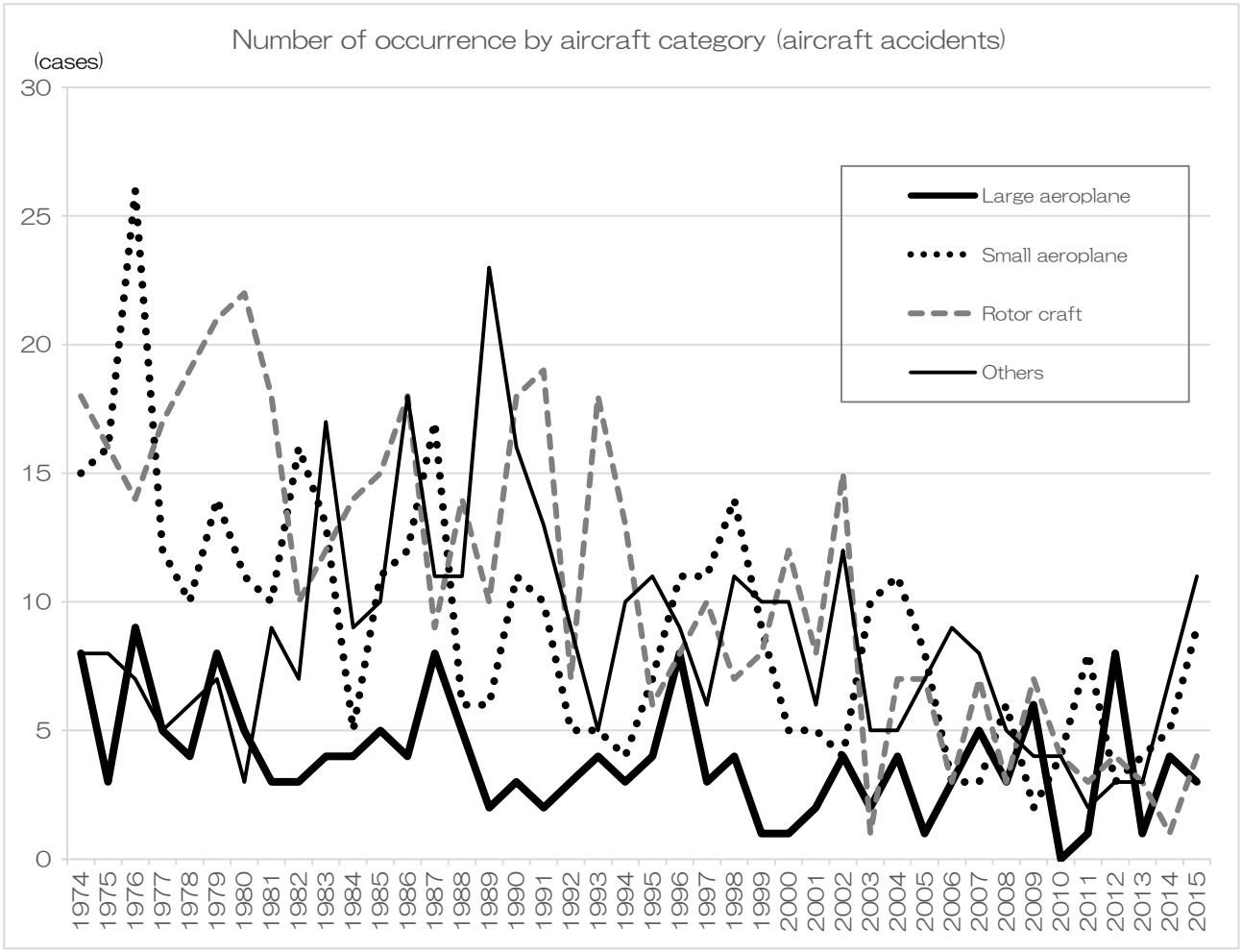
4 Number of occurrence by aircraft category (aircraft accidents)

(Cases)

Category / Year of occurrence	Aircraft			Rotor craft		Glider	Airship	Total
	Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
1974	8	15	0	17	1	8	0	49
1975	3	16	0	16	0	8	0	43
1976	9	26	0	14	0	7	0	56
1977	5	12	0	16	1	5	0	39
1978	4	10	0	18	1	6	0	39
1979	8	14	0	20	1	6	1	50
1980	5	11	0	22	0	3	0	41
1981	3	10	1	18	0	8	0	40
1982	3	16	0	9	1	7	0	36
1983	4	13	10	12	0	7	0	46
1984	4	5	6	13	1	3	0	32
1985	5	11	6	15	0	4	0	41
1986	4	12	14	15	3	4	0	52
1987	8	17	8	8	1	3	0	45
1988	5	6	7	12	2	3	1	36
1989	2	6	11	9	1	12	0	41
1990	3	11	9	16	2	7	0	48
1991	2	10	6	19	0	7	0	44
1992	3	5	5	7	0	4	0	24
1993	4	5	3	17	1	2	0	32
1994	3	4	8	13	0	2	0	30
1995	4	7	10	6	0	1	0	28
1996	8	11	5	8	0	4	0	36
1997	3	11	3	8	2	3	0	30
1998	4	14	5	6	1	6	0	36
1999	1	9	5	7	1	5	0	28
2000	1	5	5	11	1	5	0	28
2001	2	5	2	8	0	4	0	21
2002	4	4	5	15	0	7	0	35
2003	2	10	3	1	0	2	0	18
2004	4	11	2	6	1	3	0	27
2005	1	8	0	7	0	7	0	23
2006	3	3	4	2	1	5	0	18

Category / Year of occurrence	Aircraft			Rotor craft		Glider	Airship	Total
	Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
2007	5	3	4	7	0	4	0	23
2008	3	6	2	3	0	3	0	17
2009	6	2	1	7	0	3	0	19
2010	0	4	2	4	0	2	0	12
2011	1	8	1	3	0	1	0	14
2012	8	3	2	4	0	1	0	18
2013	1	4	1	3	0	2	0	11
2014	4	5	2	1	0	5	0	17
2015	3	9	3	3	1	8	0	27
Total	163	377	161	426	24	197	2	1,350

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accident Investigation Commission.
2. Large aeroplanes are aircraft with a maximum take-off weight of more than 5,700kg.
3. Small aeroplanes are aircraft with a maximum take-off weight of 5,700kg or less, excluding Ultralight planes.

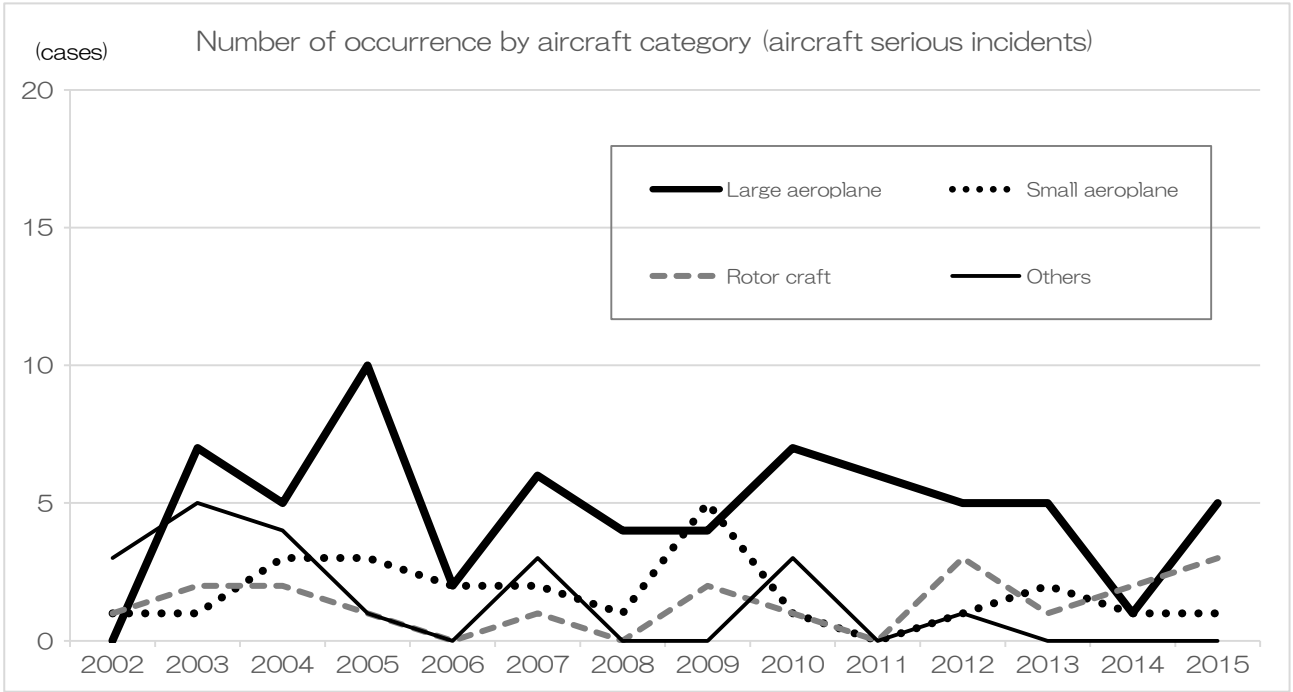


5 Number of occurrence by aircraft category (aircraft serious incidents)

(Cases)

Category / Year of occurrence	Aircraft			Rotor craft		Glider	Airship	Total
	Large aeroplane	Small aeroplane	Ultralight plane	Helicopter	Gyroplane			
2001	3	0	0	0	0	0	0	3
2002	0	1	2	1	0	1	0	5
2003	7	1	4	2	0	1	0	15
2004	5	3	4	2	0	0	0	14
2005	10	3	1	1	0	0	0	15
2006	2	2	0	0	0	0	0	4
2007	6	2	2	1	0	1	0	12
2008	4	1	0	0	0	0	0	5
2009	4	5	0	2	0	0	0	11
2010	7	1	3	1	0	0	0	12
2011	6	0	0	0	0	0	0	6
2012	5	1	0	3	0	1	0	10
2013	5	2	0	1	0	0	0	8
2014	1	1	0	2	0	0	0	4
2015	5	1	0	3	0	0	0	9
Total	70	24	16	19	0	4	0	133

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accident Investigation Commission.
2. Large aeroplanes are aircraft with a maximum take-off weight of more than 5,700kg.
3. Small aeroplanes are aircraft with a maximum take-off weight of 5,700kg or less, excluding Ultralight planes.
4. The number of cases for 2001 represents those that occurred from October onward.



6 Number of occurrence by type (railway accidents)

(Cases)

Type / Year of occurrence	Railway							Tramway							Total
	Train collision	Train derailment	Train fire	Level crossing accident	Accident against road traffic	Other accidents with casualties	Heavy property loss without casualties	Vehicle collision	Vehicle derailment	Vehicle fire	Level crossing accident	Accident against road traffic	Other accidents with casualties	Heavy property loss without casualties	
2001	0	4	1	0	0	0	0	0	0	0	0	0	0	0	5
2002	1	14	1	2	0	1	1	0	0	0	0	0	0	0	20
2003	1	20	2	0	0	0	0	0	0	0	0	0	0	0	23
2004	0	18	0	1	0	0	0	0	1	0	0	0	0	0	20
2005	2	20	0	0	0	1	0	0	1	0	0	0	0	0	24
2006	1	13	0	1	0	0	0	1	0	0	0	0	0	0	16
2007	0	12	2	3	0	0	0	0	2	0	0	0	0	0	19
2008	0	7	2	2	0	1	1	0	0	0	0	0	0	0	13
2009	0	5	1	2	0	3	0	0	0	0	0	0	0	0	11
2010	0	6	0	0	0	1	0	0	0	0	0	2	0	0	9
2011	0	12	0	1	0	1	0	0	0	0	0	0	0	0	14
2012	0	13	2	0	0	2	0	0	2	0	0	1	0	0	20
2013	0	11	1	1	0	1	0	0	1	0	0	0	0	0	15
2014	1	9	0	4	0	0	0	0	0	0	0	0	0	0	14
2015	1	5	1	4	0	1	0	0	1	0	0	0	0	0	13
Total	7	169	13	21	0	12	2	1	8	0	0	3	0	0	236

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents Investigation Commission.
2. The number of cases for 2001 represents those that occurred from October onward.

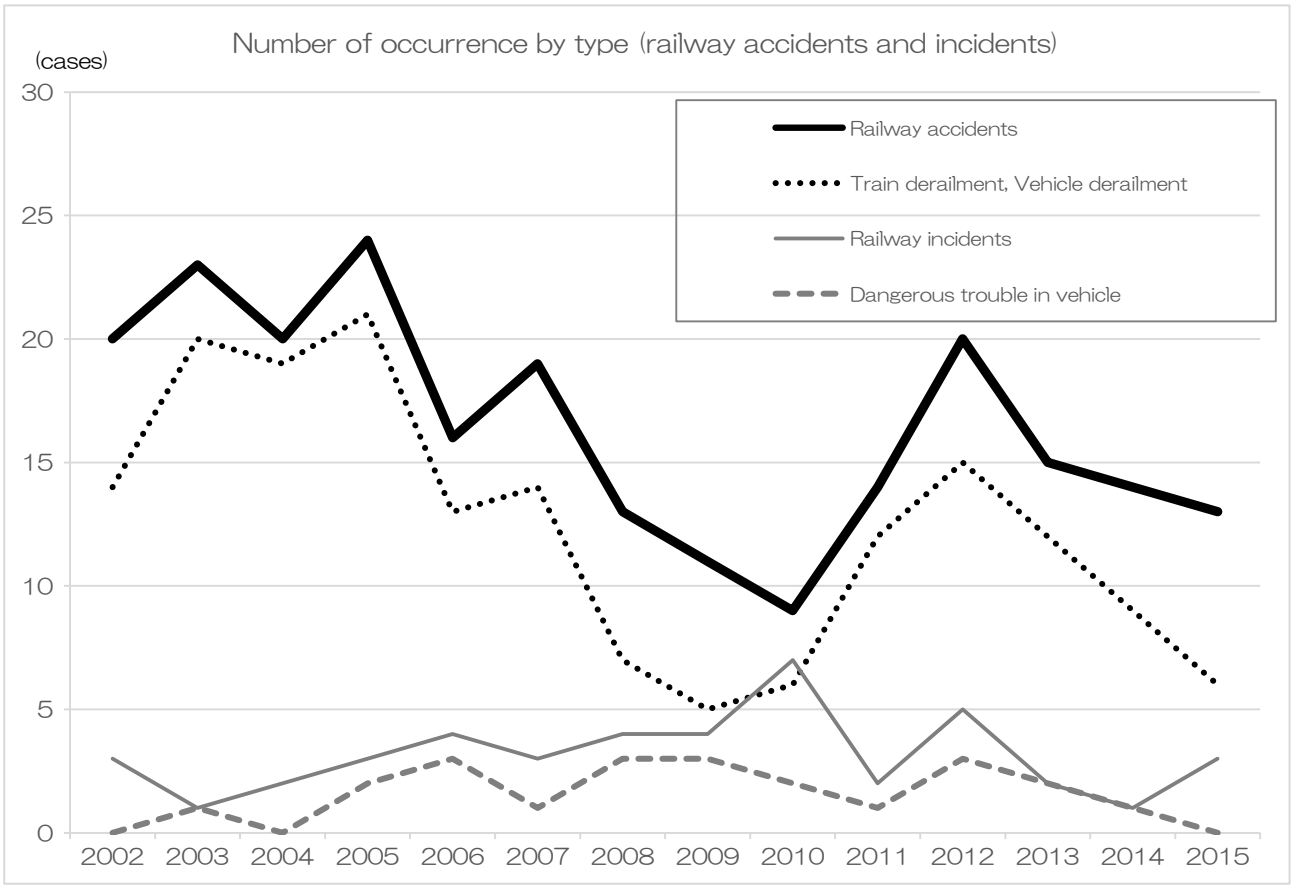
7 Number of occurrence by type (railway serious incidents)

(Cases)

Type / Year of occurrence	Railway										Tramway							Total
	Incorrect management of safety block	Incorrect indication of signal	Violating red signal	Main track overrun	Violating closure section for construction	Vehicle derailment	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	Incorrect management of safety block	Violating red signal	Main track overrun	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	
2001	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2002	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
2003	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2004	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2

Type / Year of occurrence	Railway										Tramway							Total
	Incorrect management of safety block	Incorrect indication of signal	Violating red signal	Main track overrun	Violating closure section for construction	Vehicle derailment	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	Incorrect management of safety block	Violating red signal	Main track overrun	Dangerous damage in facilities	Dangerous trouble in vehicle	Heavy leakage of dangerous object	Others	
2005	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	3
2006	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	4
2007	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	3
2008	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	4
2009	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	4
2010	1	0	0	0	1	1	0	2	0	0	1	1	0	0	0	0	0	7
2011	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
2012	0	0	0	0	1	1	0	3	0	0	0	0	0	0	0	0	0	5
2013	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
2014	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
2015	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	3
Total	1	7	0	0	6	2	2	22	0	3	1	1	0	0	0	0	0	45

(Note) 1. The figures include the cases handled by the Aircraft and Railway Accidents Investigation Commission.
2. The number of cases for 2001 represents those that occurred from October onward.



8 Number of accidents and incidents by area (marine accidents and incidents)

(Cases)

Year \ Area	In Japanese waters			Outside Japanese waters	Total
	In ports specified by the Cabinet Order	Within 12 nautical miles	In lakes or rivers		
2007	0	3	0	0	3
2008	227	576	15	55	873
2009	341	1,065	34	82	1,522
2010	308	906	38	82	1,334
2011	238	781	28	79	1,126
2012	227	804	31	53	1,115
2013	215	763	35	69	1,082
2014	194	761	31	44	1,030
2015	167	627	40	33	867
Total	1,917	6,286	252	497	8,952

(Note) The above table shows the number of accidents and incidents into which the JTSB launched an investigation as of the end of February 2016 (including those carried over from the former Marine Accident Inquiry Agency).

9 Number of accidents and incidents by type (marine accidents and incidents)

(Cases)

Year \ Type	Marine accident											Marine incident				Total
	Collision	Contact	Grounding	Sinking	Flooding	Capsizing	Fire	Explosion	Facility damage	Fatality/Injury	Others	Loss of control	Stranded	Safety obstruction	Navigation obstruction	
2007	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	3
2008	181	101	255	12	4	28	15	3	30	61	0	54	34	8	87	873
2009	325	174	431	16	19	58	42	3	38	217	2	105	33	0	59	1,522
2010	356	180	369	15	18	50	35	2	26	146	0	83	16	0	38	1,334
2011	282	145	264	12	18	57	32	1	23	142	1	103	10	1	35	1,126
2012	246	132	264	5	21	55	44	2	34	155	0	113	5	4	35	1,115
2013	265	144	210	10	25	49	33	2	38	163	2	106	7	3	25	1.082
2014	264	117	213	7	11	61	35	1	37	150	3	92	15	0	24	1,030
2015	235	95	188	5	10	59	38	3	18	117	0	80	4	4	11	867
Total	2,154	1,089	2,196	82	126	417	274	17	244	1,151	8	736	124	20	314	8,952

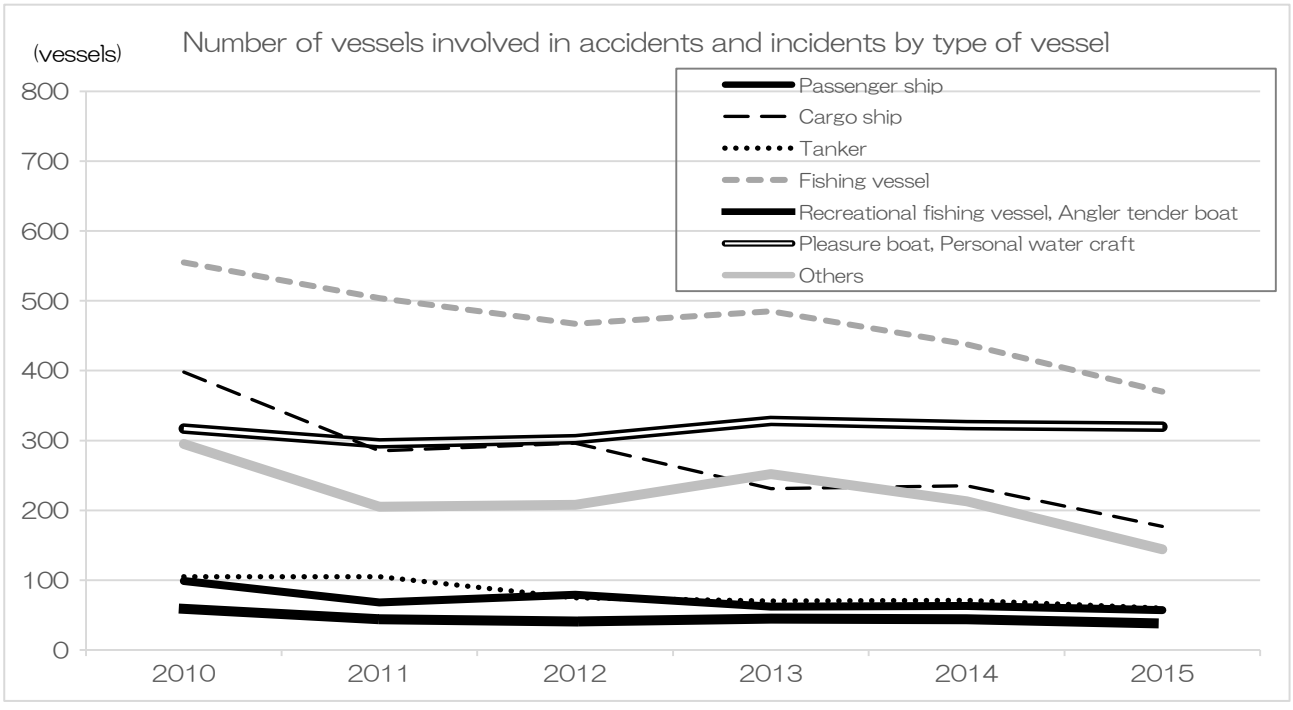
(Note) 1. The above table shows the number of accidents and incidents into which the JTSB launched an investigation as of the end of February 2016 (including those carried over from the former Marine Accident Inquiry Agency).
2. The figures in the column “Casualty” are the number of cases involving death, death and injury, missing persons, or injury which is not a result from other types of accident.

10 Number of vessels involved in accidents and incidents by type of vessel (marine accidents and incidents)

(Vessels)

Type of Vessel / Year	Passenger ship	Cargo ship	Tanker	Fishing vessel	Tug boat, push boat	Recreational fishing vessel	Angler tender boat	Work vessel	Barge, Lighter	Public-service ship	Pleasure boat	Personal water craft	Others	Total
2007	2	1	0	0	0	0	0	0	0	0	0	0	0	3
2008	55	318	55	307	98	28	6	27	60	11	125	31	7	1,128
2009	103	480	83	605	163	39	6	35	104	41	249	65	21	1,994
2010	99	398	105	555	123	53	6	48	82	25	251	66	17	1,828
2011	68	285	105	504	89	38	6	29	50	16	250	46	21	1,507
2012	79	296	75	467	91	33	8	36	59	14	247	55	8	1,468
2013	62	231	70	485	100	41	4	37	72	24	264	64	19	1,473
2014	63	235	71	438	89	39	5	35	58	17	253	69	14	1,386
2015	57	177	60	370	52	31	7	23	43	11	270	50	15	1,166
Total	588	2,421	624	3,731	805	302	48	270	528	157	1,909	446	124	11,953

(Note) The above table shows the number of vessels involved in accidents and incidents into which the JTSB launched an investigation as of the end of February 2016 (including those carried over from the former Marine Accident Inquiry Agency).



11 Number of vessels involved in accidents and incidents by gross tonnage (marine accidents and incidents)

(Vessels)

Gross tonnage / Year	less than 20 tons	20 to less than 100 tons	100 to less than 200 tons	200 to less than 500 tons	500 to less than 1,600 tons	1,600 to less than 3,000 tons	3,000 to less than 5,000 tons	5,000 to less than 10,000 tons	10,000 to less than 30,000 tons	More than 30,000 tons	Unknown	Total
2007	1	0	0	1	0	0	0	0	0	0	1	3
2008	485	52	138	216	77	24	16	17	10	15	78	1,128
2009	903	89	230	288	116	42	34	49	30	14	199	1,994
2010	900	86	175	260	128	36	37	39	25	24	118	1,828
2011	823	59	142	194	101	39	18	32	21	17	61	1,507
2012	790	53	133	199	78	33	25	38	25	20	74	1,468
2013	881	44	113	142	93	47	27	36	19	17	54	1,473
2014	830	46	86	145	87	38	26	29	17	17	65	1,386
2015	606	39	60	105	58	28	17	26	22	18	187	1,166
Total	6,219	468	1,077	1,550	738	287	200	266	169	142	837	11,953

(Note) The above table shows the number of vessels involved in accidents and incidents into which the JTSB launched an investigation as of the end of February 2016 (including those carried over from the former Marine Accident Inquiry Agency).

12 Number of vessels involved in accidents and incidents in 2015 by type of accident/incident and type of vessel (marine accidents and incidents)

(Vessels)

Type of accident/incident / Type of vessel	Marine accident											Marine incident				Total
	Collision	Contact	Grounding	Sinking	Flooding	Capsizing	Fire	Explosion	Facility damage	Fatality/Injury	Others	Loss of control	Stranded	Safety obstruction	Navigation obstruction	
Passenger ship	11	11	7	0	0	0	5	1	1	11	0	2	1	3	4	57
Cargo ship	84	21	43	0	1	0	7	0	6	7	0	7	1	0	0	177
Tanker	41	4	6	0	1	1	2	0	1	0	0	4	0	0	0	60
Fishing vessel	152	27	60	2	6	27	15	1	0	49	0	28	0	0	3	370
Tug boat, push boat	19	6	14	1	0	4	0	0	2	4	0	2	0	0	0	52
Recreational fishing vessel	18	3	3	0	0	0	1	0	1	3	0	1	0	0	1	31
Angler tender boat	1	0	5	0	0	0	0	0	0	1	0	0	0	0	0	7
Work vessel	9	4	3	2	0	0	1	0	0	3	0	1	0	0	0	23

Type of accident/ incident / Type of vessel	Marine accident											Marine incident				Total
	Collision	Contact	Grounding	Sinking	Flooding	Capsizing	Fire	Explosion	Facility damage	Fatality/Injury	Others	Loss of control	Stranded	Safety obstruction	Navigation obstruction	
Barge, Lighter	18	5	10	1	0	2	0	0	3	3	0	1	0	0	0	43
Public-service ship	0	2	2	0	0	0	0	0	0	4	0	2	0	0	1	11
Pleasure boat	110	15	42	1	2	33	7	1	7	16	0	31	2	1	2	270
Personal water craft	20	3	1	0	0	0	0	0	0	25	0	1	0	0	0	50
Others	10	1	3	0	0	0	0	0	0	0	0	1	0	0	0	15
Total	493	102	199	7	10	67	38	3	21	126	0	81	4	4	11	1,166

(Note) 1. The above table shows the number of vessels involved in accidents and incidents into which the JTSB launched an investigation as of the end of February 2016.

2. The figures in the column "Fatality/Injury" are the number of cases involving death, death and injury, missing persons, or injury which is not a result from other types of accident.

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